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(54) Improved plant for forming ceramic tiles or slabs

(57) A plant (1) for forming ceramic tiles or slabs comprising compacting means suitable for subjecting a continuous strip (100) of powdered ceramic material on a conveyor belt (2) to continuous pressing, the compacting means comprising at least one pair of sliding belts (42, 52), on top of and facing one another, each of which is partially wound on at least one motorised drive roller (40, 50), means (44, 54) being foreseen for locking the aforementioned drive rollers (40, 50) when the plant (1) is shut down, so that the respective belts (42, 52) remain subjected to a tension of over 90% that to which they are subjected when the plant is operating.

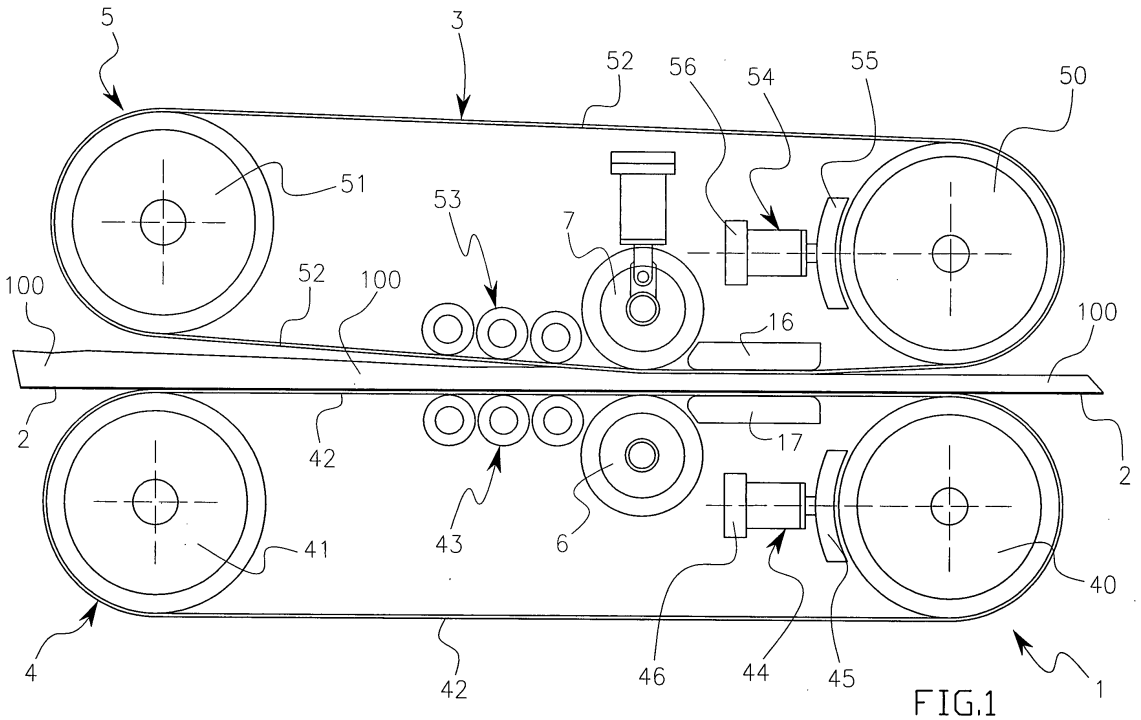

FIG.1

EP 1 669 178 A2

Description

[0001] The present invention concerns, in general, a plant for manufacturing ceramic tiles or slabs, and in particular a plant for forming the aforementioned slabs.

[0002] Plants for forming ceramic slabs are known that comprise a conveyor belt suitable for making a continuous strip of powdered ceramic material advance through a pressing station, which is equipped with compacting means that allow the powders to be continuously pressed on the belt that advances in the station, to obtain an article of coherent material.

[0003] In particular, the compacting means generally comprise a pair of sliding belts, on top of and facing one another, one of which is arranged below the conveyor belt, and the other above it. Said belts are wound on a respective motorised drive roller and a respective idler roller, and they are kept pressed against the strip of powdered material through a pair of opposite pressing rollers, the first of which is arranged above the top belt and the second below the bottom belt, said pressing rollers defining the compacting area of the strip of powders.

[0004] Such a plant is described in detail in European patent application EP 1 356 909 to the same Applicant, to which we refer for a complete understanding thereof.

[0005] Forming plants of this type are generally inserted inside a production line that comprises other operating stations, like for example: a cutting station, where the compacted article is trimmed at the edges and divided into tesserae; a decorating station; and a station suitable for subjecting the tesserae to a second pressing.

[0006] Due to the inevitable failures that can occur in the aforementioned operating stations, the forming plant must be periodically shut down so as to make it possible to carry out repairs.

[0007] A particularly serious drawback of known forming plants lies in the fact that in such circumstances, i.e. when said forming plants are shut down, a non-negligible portion of the strip of compacted material is irrevocably damaged and, consequently, must be discarded.

[0008] Such a drawback derives from the fact that the tension to which the belts of the compacting means are subjected is different according to whether the plant is shut down or is working. In particular, when the forming plant is shut down, said belts are taut between the respective drive and idler rollers in a uniform manner; vice-versa, when the plant is working, the distribution of the tensions in the belts is such that, in the portion between the drive rollers and the compacting area, they are subjected to a greater tension.

[0009] For this reason, during the step of shutting down and starting up the forming plant, the variation in tension in said portion of the belts causes, in the first case, an elastic shortening and, in the second case, an elastic stretching thereof, said stretching and shortening determining a consequent sliding of the belts on the strip of compacted material that produces cracks and splits in it.

[0010] To avoid the plant stopping, sometimes the production lines are equipped with storage devices suitable for stocking the strip of compacted material produced by the forming plant that continues to work even when the line has stopped downstream of it; however, in many circumstances said devices can do no more than delay the inevitable stopping of the plant and, therefore, do not solve the problem effectively.

[0011] The purpose of the present invention is that of allowing the forming plants to shut down without compromising its production continuity, i.e. avoiding the strip of compacted powders being damaged.

[0012] Such a purpose is accomplished through a plant for forming ceramic tiles or slabs comprising compacting means that allow a strip of powdered ceramic material on a conveyor belt to be subjected to continuous pressing, which comprise at least one pair of sliding belts, on top of and facing one another, each of which is wound inside at least one motorised drive roller; said plant being provided with means for locking said drive rollers when the plant itself is shut down, so that the respective belts remain subjected to a tension the same as, or very close to, that to which it is subjected during operation. In particular, the invention foresees that said belts remain subjected to a tension of over 90% that of normal operation.

[0013] The drive rollers are indeed generally engaged in rotation through an actuation device (e.g. an electric motor) that, when switched off, makes the roller themselves idle and free to rotate in the retrograde sense helping the shortening of the belts, which tend to spontaneously go back into non-deformed configuration.

[0014] Thanks to this solution, on the other hand, the drive rollers are prevented from rotating after the actuation device has been switched off and, therefore the belts are prevented from immediately cancelling the stretching during operation and, therefore from sliding on the article of compacted ceramic powders, damaging it.

[0015] In accordance with a first embodiment of the invention, each drive roller has a mechanical brake associated with it, for example a shoe brake, which acts on the transmission shaft that connects the drive roller itself to the actuation device.

[0016] According to an alternative embodiment, the locking devices instead comprise an electronic system suitable for controlling the aforementioned actuation device, so that when the forming plant stops it exerts a constant torque on the drive rollers such as to balance the elastic force of the belts keeping them still and, at the same time, taut.

[0017] 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, in which:

- figure 1 shows a schematic side section view of the plant according to the invention.

[0018] From the mentioned figure it can be seen that

the plant 1, which comprises a motorised conveyor belt 2 on which, through normal devices, not illustrated since they are *per* se known, a continuous strip 100 of powders is deposited.

[0019] The belt 2 crosses a pressing station 3 that has the function of pressing the powders of the strip 100 to obtain an article, substantially parallelepiped in shape, of coherent material. Such an article can possibly then be decorated and then divided into tesserae of suitable size according to the size of end product that one wishes to obtain, said tesserae being able to be subjected to a second pressing step.

[0020] The pressing station 3 comprises two compacting devices 4 and 5, motorised and one on top of another, the first of which is arranged below the belt 2, and the second above it at a height from the belt 2 that can be adjusted according to the thickness of the strip 100 of powders to be compacted, as well as the pressure value at which one wishes to carry out the pressing.

[0021] Each of the compactors 4 and 5 is provided with a motorised drive roller and an idle roller, respectively indicated with reference numerals 40, 41 and 50, 51, on which a respective belt 42, 52 is wound.

[0022] Each drive roller 40 and 50 is engaged in rotation by a respective transmission shaft (not shown) that receives the motion from an actuation device, which can indifferently comprise two independent motors or a single motor for both of the drive rollers.

[0023] Between each pair of rollers 40 and 41, and 50 and 51 a roller conveyor 43 and 53 is arranged, consisting of a plurality of idle rollers that have the function of keeping the belts 42 and 52 pressed to press the strip 100 of powdered material. In the illustrated embodiment, the roller conveyor 53 is inclined in the direction in which the belt 2 advances so as to make the compacting of the powders of the strip 100 gradual.

[0024] Downstream of the roller conveyors 43 and 53 there are two opposite rollers 6 and 7, of which the roller 6 is arranged below the belt 42 whereas the roller 7 is arranged above the belt 52, and presses it against the strip 100 of powders that advance on the belt 2.

[0025] The rollers 6 and 7 define the pressing area of the strip 100 of powders, downstream of which there is a decompression area in which the strip of powders expands, thanks to suitable means, in a controlled manner to avoid the occurrence of cracks or splits in the compacted article. In the illustrated example embodiment, said decompression area comprises two overlapping plates 16 and 17, the bottom one of which 17 is arranged below the belt 2 and the top one of which 16 is arranged above the belt 2, both in contact with the belts 42 and 52.

[0026] As clearly illustrated in figure 1, each drive roller 40 and 50 has a locking device associated with it, 44 and 54 respectively, which, acting on the rollers 40 and 50 or else on the transmission shaft (not shown) that connects them to the actuation device, is suitable for preventing any rotation of said rollers when the plant 1 is stopped.

[0027] In the particular illustrated embodiment, each of said locking devices comprises a brake shoe, 45 and 55, associated with a jack, 46 and 56, which is suitable for pressing said brake shoe against the drive roller or against its transmission shaft.

[0028] During the operation of the plant, the locking means 44 and 54 are inactive and only starting working when the actuation device is deactivated and the drive rollers 40 and 50 stop; in this way the belts, 42 and 52, in the portion between the drive rollers 40 and 50 and the compacting area remain taut and cannot elastically shorten.

[0029] When the plant is started up again, the actuation device of the drive rollers 40 and 50 is once again activated, however the locking devices 44 and 54 continue to act until the torque applied to the drive rollers 40 and 50 is such as to avoid harmful sliding of the belts 42 and 52 on the strip 100 of compacted material. In particular, it is foreseen that said locking devices 44 and 54 deactivate when the torque applied to the drive rollers 40 and 50 is such as to subject the belts to a tension of over 90% the normal operating tension.

[0030] Of course numerous practical-application modifications can be made to the invention in object, without by this departing from the inventive idea as claimed below.

Claims

1. Plant (1) for forming ceramic tiles or slabs comprising a conveyor belt (2) on which a continuous strip (100) of powdered ceramic material is created, and compacting means suitable for subjecting said strip (100) of powders on the belt (2) to continuous pressing, said compacting means comprising at least one pair of sliding belts (42, 52), on top of and facing one another, each of which is partially wound on at least one motorised drive roller (40, 50),
characterised in that it comprises means (44, 54) for locking said drive rollers (40, 50) when the plant (1) is shut down, so that the respective belts (42, 52) remain subjected to a tension of over 90% that to which they are subjected when the plant (1) is operating.

2. Plant (1) according to claim 1, **characterised in that** each drive roller (40, 50) has at least one mechanical brake (44, 54) associated with it.

3. Plant (1) according to claim 1, **characterised in that** said mechanical brake (44, 54) acts on the transmission shaft of the corresponding roller.

4. Plant (1) according to claim 1, **characterised in that** said mechanical brake is a shoe brake.

5. Plant (1) according to claim 1, **characterised in that** said locking means comprise an electronic system

suitable for controlling the actuation device of the drive rollers (40, 50), so that when the plant (1) stops said actuation device exerts a constant torque value suitable for balancing the elastic force of the belts (42, 52) keeping them, at the same time, still and taut.

6. Plant (1) according to claim 1, **characterised in that** said locking means (44, 54) start working when the actuation device of the drive rollers (40, 50) is switched off, and deactivate when the plant is switched back on when the value of the torque applied by said actuation device is such as to subject the belts (42, 52) to a tension of over 90% the normal operating tension, avoiding harmful sliding thereof with respect to the strip (100) of compacted powders.

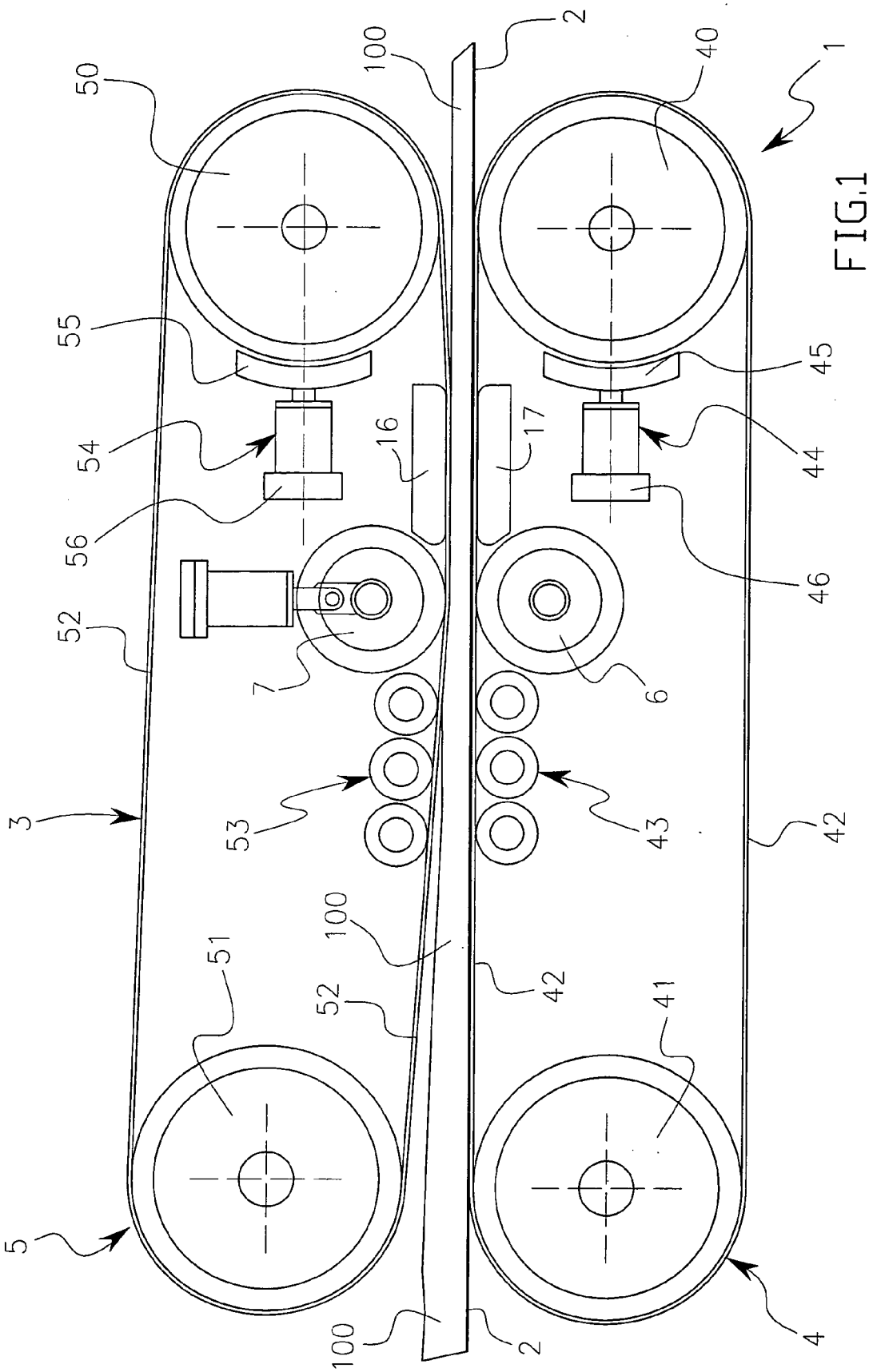

FIG.1