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(54) Mixer axis for dual axis concrete mixer, and dual axis concrete mixer

(57) A mixing axis (1, 2) of a dual axis mixer for concrete mix, said mixing axis comprising several mixer elements attached to the mixing axis, said mixer elements including a mixing shaft (3) protruding substantially radially from the mixing axis, and at least one mixer blade (4) attached to the outer end of the mixing shaft, so that on that section of the mixing axis (1, 2) of the dual axis mixer that is located in the mixing tank, mixer elements are attached at nine successive mixer element fastening points (A-I), so that in the first, second and last fastening point (A, B and I), the total area of the mixer blades (4, 4') connected to a single fastening point is substantially four times as large as the total area of the mixer blades (4) connected to a single fastening point in the third, fourth, sixth and eighth fastening point (C, D, F and H). The invention also relates to a dual axis mixer provided with a described mixing axis.

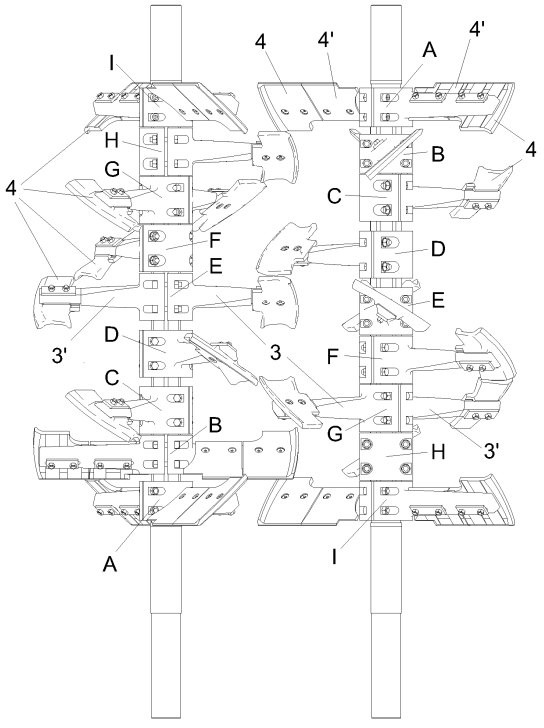

FIG. 1C

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Description

[0001] The invention relates to the mixer axis of a dual axis mixer used in the production of concrete mix, as well as to a dual axis mixer provided with this kind of mixer axis. More precisely, the invention relates to the positioning and quantity of mixer elements arranged on the mixer axis.

[0002] An apparatus used in the production of concrete mix is a dual axis mixer where the concrete mix to be produced is mixed by intermediation of mixing means attached to two axes contained in the mixing tank. In these dual axis mixers, the mixing axes are arranged horizontally in the mixing tank. Generally the mixing means attached to the mixing axes comprise mixer shafts fastened to the mixing axes, said shafts protruding essentially radially from the mixing axis, as well as mixer blades attached to the shaft ends.

[0003] With dual axis mixers, the mixing effect obtained in the concrete mix to be produced is typically better and more efficient than the mixing effect obtained with conventional single axis mixers, which means that by using dual axis mixers, larger quantities of concrete mix can be produced more rapidly.

[0004] The most essential objective in the development of concrete mixers, including dual axis mixers, is a faster production process for concrete mix, and said objective is achieved by increasing the capacity of the mixer by more efficient mixing of the concrete mix. Said objective is emphasized particularly in the production of concrete mixes requiring longer mixing periods, such as polymer mixes. With dual axis mixers, it has been attempted to reach said objective by increasing the rotation speeds of the mixing axes of the mixer.

[0005] In a solution according to the present invention, an increase in the capacity of the dual axis mixer is achieved by increasing the number of the mixer elements in the mixer, by altering the shape of the mixer elements and by positioning said mixer elements on the mixing axis.

[0006] In a solution according to the invention, the number of the mixer elements connected to the mixing axes, i.e. the number of the mixing shafts attached to the mixing axis and of the mixer blades attached to said shafts has been increased in comparison with conventional arrangements. Moreover, the increase in the mixer elements has been realized at certain fastening points of said mixer elements, and the number of blades attached to a single shaft has likewise been increased.

[0007] In a solution according to the invention, on that section of the mixing axis that is located in the mixing tank of the dual axis mixer, mixer elements are attached at nine successive mixer element fastening points, so that at the first, second and last fastening point, the total area of the mixer blades of the mixer elements connected to a single fastening point is substantially four times as large as the total area of the mixer blades connected to a single fastening point at the third, fourth, sixth and eighth fastening points.

[0008] In a preferred embodiment according to the invention, at least on that section of the first mixing axis, and advantageously also of the second mixing axis, that is located in the mixing tank of the dual axis mixer, there are attached 14 mixer elements at nine different fastening points.

[0009] In a solution according to the invention, also the position of the mixer blades attached to the mixing shafts of the mixing axes is such that the mixer blades of the mixing shafts attached to the first two fastening points of the first end of the first mixing axis tend to shift the concrete to be mixed further away from the first end of the first mixing axis. As for the rest of the mixer blades attached to the first mixing axis by intermediation of mixing shafts tend to shift the concrete to be mixed towards said first end of the first mixer axis. The positions of the mixer blades of the second mixing axis of the mixer are opposite with respect to the first mixing axis.

[0010] According to performed experiments, by using this kind of dual axis mixer of to the invention, there is achieved a rise of about 60% in the capacity in comparison with conventional dual axis mixers, and the increase in the power consumed by the mixer elements is only about 15% in comparison with conventional solutions.

[0011] More precisely, the mixing axis according to the invention is characterized by what is set forth in the characterizing part of claim 1, and the dual axis mixer according to the invention is characterized by what is set forth in the characterizing part of claim 7.

[0012] The invention is described in more detail below, by way of example, with reference to the appended drawings, where

Figure 1A illustrates the mixing axes of a dual axis mixer according to the invention, seen in a three-dimensional, isometric view,

Figure 1B illustrates the mixing axes of the dual axis mixer of Figure 1A, viewed from below, and

Figure 1C illustrates the mixing axes of the dual axis mixer of Figure 1A, viewed from the side.

[0013] The mixing axes of the dual axis mixer illustrated in the drawings comprise two adjacent mixing axes 1 and 2, positioned horizontally in the mixing tank of the mixer, said mixing axes extending through the end surfaces of the mixing tank of the mixer. On that section of the mixing axes 1 and 2 that is located in the mixing tank, there are attached several mixer elements, each of said mixer elements comprising a mixing shaft 3 protruding radially from the mixing axis and a first mixer blade 4 attached in the area of the outer end of the mixing shaft. In addition, part of the mixing shafts 3 are provided, in connection with the first mixer blade 4, also with a second mixer blade 4', said second mixer blade being arranged in a space left in between the first mixer blade and the

mixing axis, so that the mixer blades cover substantially the whole length of the mixing shaft.

[0014] In the solution of the invention illustrated in the drawings, the mixing shafts 3 are attached to nine different fastening points A-I located on the mixing axes 1 and 2, said fastening points being best visible in Figure 1C. From Figure 1C, it is also seen that in the mixing axis 2, the order of the fastening points of the mixing axis 1 is reversed. At some of the fastening points, in addition to a first mixing shaft 3, there also is attached a second mixing shaft 3' to extend from the mixing axes 1 and 2 to the opposite direction with respect to the first mixing shaft.

[0015] At both of the fastening points A and B of the mixing axes 1 and 2, there are attached two mixing shafts 3, 3' that are pointed to opposite directions, each of said mixing shafts being provided with two mixer blades 4, 4'. The mixer elements and particularly the mixer blades 4, 4' attached to said fastening points A and B, said fastening points being located in the vicinity of the edge of the mixing tank of the mixer, are positioned so that as the mixing axes rotate, said mixer blades shift the concrete to be mixed substantially away from the edge of the mixing tank.

[0016] At each of the fastening points C and D of the mixing axes 1 and 2, there is attached only one mixing shaft 3, said mixing shaft being at the outer end provided with one mixer blade 4. The mixer blades of the mixer elements located at the fastening points C-I are all positioned so that as the mixing axes rotate, they shift the concrete mix to a substantially opposite direction with respect to the mixer blades of the mixer elements of the fastening points A and B.

[0017] At the fastening point E of the mixing axes 1 and 2, there are attached two mixing shafts 3, 3', pointing to opposite directions, each of said shafts being at the outer end provided with one mixer blade 4.

[0018] At the fastening point F of the mixing axes 1 and 2, there is attached one mixing shaft 3, said mixing shaft being at the outer end provided with one mixer blade 4.

[0019] At the fastening point G of the mixing axes 1 and 2, there are attached two mixing shafts 3, 3', pointing to opposite directions, each of said shafts being at the outer end provided with one mixer blade 4.

[0020] At the fastening point H of the mixing axes 1 and 2, there is attached one mixing shaft 3, said mixing shaft being at the outer end provided with one mixer blade 4.

[0021] At the fastening point I of the mixing axes 1 and 2, there are attached two mixing shafts 3, 3', pointing to opposite directions, each of said shafts being provided with two mixer blades 4, 4'.

[0022] Thus, in the example according to the invention and illustrated in the drawings, to each of the mixing axes 1, 2 of the dual axis mixer, there are attached 14 mixer elements at nine different mixer element fastening points A-I.

[0023] As for the embodiment of the invention illustrated in the drawings, it is pointed out that because the mixer elements of the mixing axes 1 and 2 are arranged in a mutually reversed order, they also rotate in mutually opposite directions. In the example of the Figures, the mixing axis of the rotary axis 1 rotates clockwise, whereas the mixing axis of the rotary axis 2 rotates counterclockwise.

[0024] In the described arrangement according to the invention, at the fastening points A, B and I, the total area of the mixer blades 4, 4' connected to each individual fastening point is four times as large as the total area of the mixer blades connected to each individual fastening point at the fastening points C, D, F and H. Moreover, at the fastening points E and G, the total area of the mixer blades connected to both individual fastening points is twice as large as the total area of the mixer blades connected to each individual fastening point at the fastening points C, D, F or H.

[0025] In the solution according to the invention illustrated in the drawings, the mutual angle of the successive mixing shafts 3 on the cross-sectional plane of the mixing axis is 60 degrees, which is advantageously achieved by using a rod that is hexagonal in cross-section as axes of mixing axes 1, 2.

[0026] In addition, the mutual phase shift between the first mixing axis 1 and the second mixing axis 2 is advantageously 30 degrees.

[0027] The angle of the mixer blades in relation to the rotary direction, i.e. to the cross-sectional plane of the mixing axes 1, 2 at the mixing shaft 3 is advantageously 35 degrees.

[0028] According to performed experiments, by using a dual axis mixer according to the invention, there is achieved a capacity rise of about 60% in comparison with conventional dual axis mixers, and the increase in the power consumed by the mixer elements is only about 15% in comparison with conventional arrangements.

Claims

1. A mixing axis (1, 2) of a dual axis concrete mixer, said mixing axis comprising plurality of mixer elements attached to a mixing axis, said mixer elements comprising a mixing shaft (3) protruding essentially radially from the mixing axis, and at least one mixer blade (4) attached to the outer end of the mixing shaft, **characterized in that** on that section of the mixing axis (1, 2) of the dual axis mixer that is located in the mixing tank, mixer elements are attached at nine successive mixer element fastening points (A-I), so that in the first, second and last fastening point (A, B and I), the total area of the mixer blades (4, 4') connected to a single fastening point is substantially four times as large as the total area of the mixer blades (4) connected to a single fastening point in the third, fourth, sixth and eighth fastening point (C,

D, F and H).

2. A mixing axis (1, 2) according to claim 1, **characterized in that** at the fifth and seventh fastening points (E and G), on that section of the mixing axis (1, 2) that is located in the mixing tank, the total area of the mixer blades (4) connected to a single fastening point is substantially twice as large as the total area of the mixer blades (4) connected to a single fastening point at the third, fourth, sixth and eighth (C, D, F and H) fastening point.

3. A mixing axis (1, 2) according to claim 1 or 2, **characterized in that** the number of the mixer elements attached to that section of the mixing axis (1, 2) that is positioned on the section located in the mixing tank is 14.

4. A mixing axis according to any of the claims 1 - 3, **characterized in that** at the first end area of that section of the mixing axis (1, 2) that is located in the mixing tank, at each of the two first fastening points and at the last fastening point (A, B and I) of the mixer elements, there are positioned two mixer elements extending to opposite directions.

5. A mixing axis (1, 2) according to any of the claims 1 - 4, **characterized in that** at each of the fifth and seventh mixer element fastening points (E and G) of that section of the mixing axis (1, 2) that is located in the mixing tank, there are positioned two mixer elements extending to opposite directions.

6. A mixing axis (1, 2) according to any of the claims 2-5, **characterized in that** the mixer elements attached to two first mixer element fastening points (A and B) of that section of the mixing axis (1, 2) that is located in the mixing tank and/or to the last mixer element fastening point (I) comprise two adjacent mixer blades (4, 4') attached to one and the same mixing shaft (3, 3'), said adjacent mixer blades substantially covering the whole length of the mixing shaft.

7. A dual axis concrete mixer, **characterized in that** the dual axis mixer is provided with at least one mixing axis (1, 2) according to claims 1 - 6.

8. A dual axis mixer according to claim 7, **characterized in that** the dual axis mixer is provided with two adjacent mixing axes (1, 2) according to claims 1 - 6, so that the sections of the mixer elements of the adjacent mixing axes that are located in the mixing tank are on the mixing axes placed in a mutually reversed order.

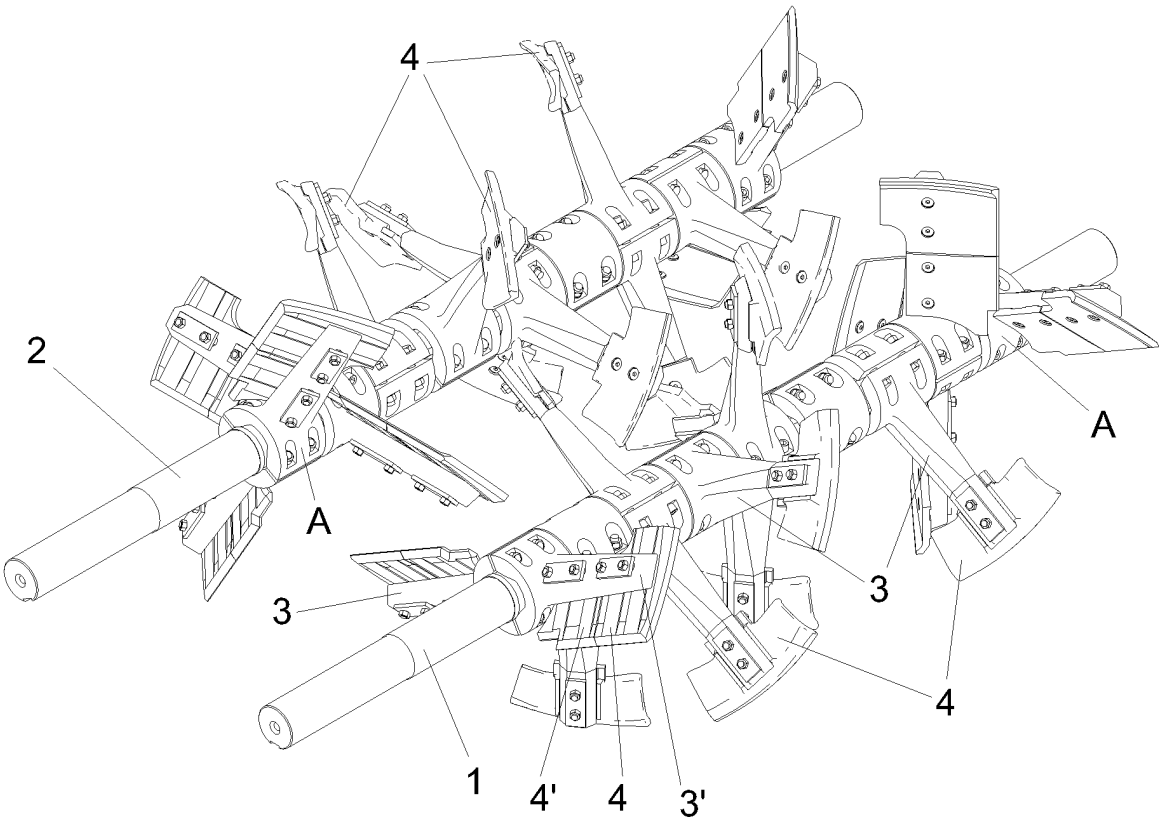

FIG. 1A

FIG. 1B

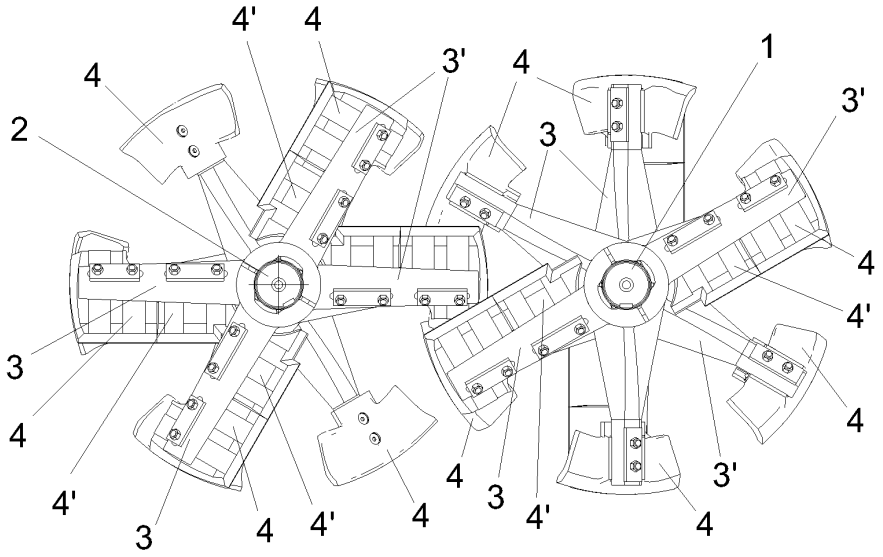
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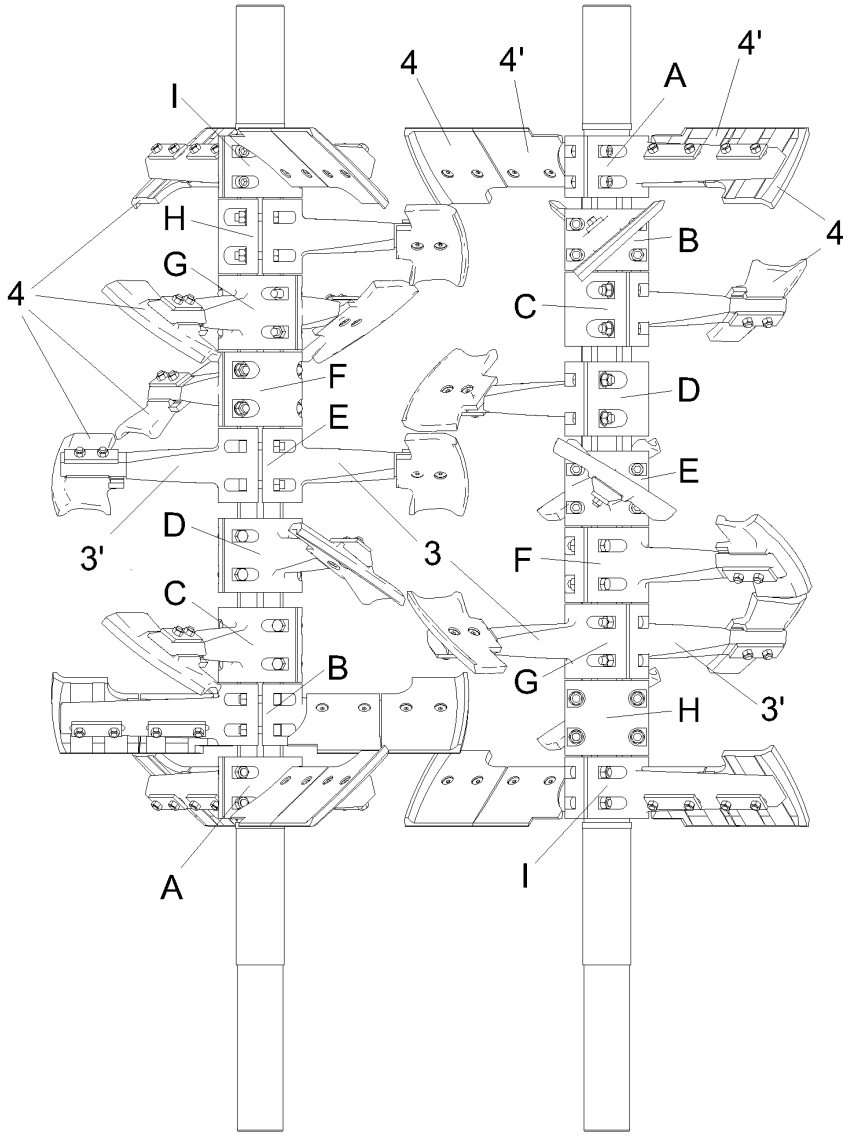
FIG. 1C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