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(54) Mechanical mixer, in particular for granular or powder material

(57) The mixer comprises a container (10) enclosing a mixing chamber (11) having a cylindrical wall (12), the axis (A) of which is horizontal or nearly horizontal, and means for rotating the container (10) in both directions about said axis (A), mixing of the material being carried out within said mechanical (11) of the container. For discharging material from the rotating container (10), there is provided on the outer surface of the cylindrical wall (12) a corridor (30) which extends through an arc of the cross-section of the wall (12), and has a first end (30') communicating with the mixing chamber (11) via a passage aperture (31) provided in the cylindrical wall, and a second end (30") open towards the outside environment; said corridor (30) has a length such that, when said passage aperture (31) of the first end (30') is encountered by the material contained in the mixing chamber (11), the second end (30") lies at a level higher than the level of the material which enters the corridor (30); the container (10) is rotated in the direction from the second end (30") towards the first end (30') to discharge material from the chamber (11) via said corridor (30), and in the opposite direction during the mixing stage.

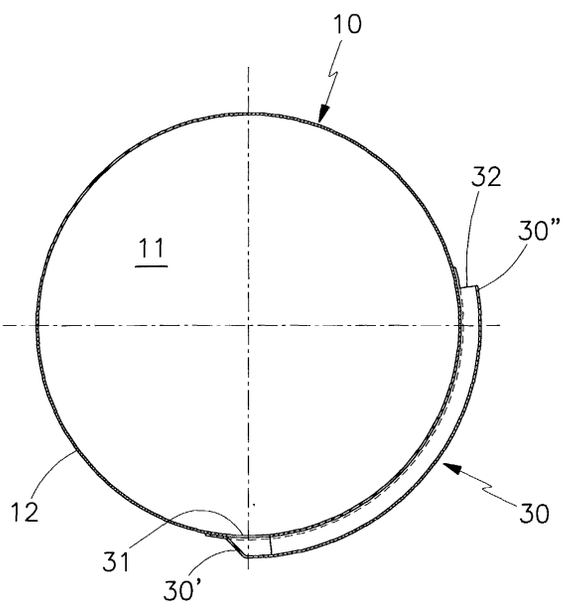

FIG.3

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Description

[0001] This invention relates to a mechanical mixer, in particular for granular or powder material; a typical application is in the preparation of material to be pressed in moulds, to form ceramic tiles.

[0002] Mechanical mixers are known comprising a container enclosing a mixing chamber having a cylindrical wall of horizontal or nearly horizontal axis, and means for rotating the container about said axis, the material being mixed within the chamber of the rotating container, in particular with the aid of suitable mixing means, and possibly with the addition of liquid substances.

[0003] Typically, the mixer of the invention is of the type comprising means for evacuating the mixed material during rotation of the mixer, so that the treated material has already been evacuated from the mixing chamber when the end of the mixing cycle is reached.

[0004] Each time the mixer is required to mix material of different characteristics than the material which was last mixed, not only must the previous material be evacuated, but all residual material must also be removed if the subsequent material is not to be contaminated by the preceding material. In particular, if the material to be mixed is changed with relatively high frequency, said emptying operations result in considerable loss of time, in addition to having to be carried out manually.

[0005] An object of this invention is to provide a mixer able to effect particularly effective and rapid motorized or even automatic discharge of the residual material or even of the entire load of mixed material, using extremely simple and economical means.

[0006] This and further objects are attained by the invention as characterised in the claims.

[0007] The invention is described in detail hereinafter with the aid of the accompanying figures, which illustrate one embodiment thereof by way of non-limiting example.

[0008] Figure 1 is a general view of the mixer to which the invention is applied.

[0009] Figure 2 is an enlarged detail of Figure 1, to illustrate the invention.

[0010] Figure 3 is a section on the plane III-III of Figure 2.

[0011] Figures 4A, 4B and 4C show the section of Figure 3 in three successive significant angular positions during a stage in the mixing of the material.

[0012] Figures 5A, 5B and 5C show the section of Figure 3 during a stage in the emptying of the material from the chamber.

[0013] The mixer of the invention comprises a container 10 enclosing a mixing chamber 11 having a cylindrical wall 12, the axis A of which is horizontal or nearly horizontal.

[0014] The term "cylindrical wall" 12 means any wall in the form of a surface of rotation, of axis A; in particular, said wall 12 can be frusto-conical or of barrel shape.

[0015] The container 10 possesses a first closed vertical end 21 to which a duct 13 of zig-zag axis is rigidly fixed, for exit of the material from the chamber 11.

[0016] The container 10 and the duct 13 are rotated rigidly about the axis A; for this purpose they both rest on pairs of wheels 14, which provide a support for their rolling about the axis A.

[0017] According to the embodiment shown in the figures, a toothed wheel 15 is provided rigid with the duct 13, coaxial with A, to be rotated by a geared motor 17 via a transmission chain 16.

[0018] The material to be mixed is fed into the chamber 11 through a stationary inlet 18 positioned on that vertical end 22 opposite the first end 21 in which the exit duct 13 is located.

[0019] The second flat end 22 of the container 10 has a wide aperture closed by a fixed plate 23, which is coupled to the end 22 via gaskets acting by sliding.

[0020] The container 10 is rotated about its axis A, by rolling on the wheels 14; the fed material is mixed within its chamber 11 by means of said rotation. Various members (of known type) can be provided in the chamber 11 to intervene during the mixing; for example, in Figure 1 rotating members are shown schematically in Figure 1, operated by a geared motor 191.

[0021] According to the embodiment shown in the figures, the mixed material leaves the chamber 11 automatically through the duct 13, as a result of the rotation of the duct 13 simultaneously with the rotation of the container 10.

[0022] According to the invention, to discharge residual material from the rotating container 10, on the outer surface of the cylindrical wall 12 there is provided a corridor 30, extending along an arc of the cross-section of the wall 12, and having a relatively small constant radial dimension (defining the thickness of the corridor) and an axial dimension (defining the width of the corridor) which at a first end equals the entire axial dimension of the mixing chamber 11.

[0023] Said corridor possesses a first end 30' closed against the outside environment and communicating with the mixing chamber 11 via a passage aperture 31 provided in the cylindrical wall 12. The corridor also possesses a second end 30" having a mouth 32 open towards the outside environment.

[0024] The corridor 30 extends through an arc of length such that, when the passage aperture 31 encounters the material contained in the mixing chamber 11, the second end 30" lies at a level higher than the level attained by the material which enters the corridor 30; in particular, it lies at a level higher than the level of the material contained in the chamber 11 itself.

[0025] Finally according to the invention, the container 10 is rotated in the direction from the second end 30" towards the first end 30' to discharge the material from the chamber 11 via said corridor 30, and in the opposite direction during the mixing stage.

[0026] In detail, during the mixing stage (illustrated in Figures 4A, 4B and 4C) the container is rotated in the

direction from the first end 30' towards the second end 30" (in the anticlockwise direction in the figures). When the aperture 31 is encountered by the material M contained in the chamber 11, part of the material M penetrates through it by gravity into the corridor 30; however the mouth 32 of the corridor lies at a level higher than the level of M and, more to the point, at a level higher than the level of the material M' which has penetrated into the corridor 30 (because this material not only cannot exceed the level of M, but because of friction during its travel is normally lower than the level of M); consequently the material M' does not leave from the mouth 32 (as illustrated in Figure 4A). As the container 10 continues its rotation, the second end 30" climbs increasingly higher with respect to the first end 30', hence the material M' lying within the corridor 30 does not leave from the mouth 32 but indeed returns by gravity into the chamber 11 through the aperture 31 (Figure 4B). Finally, the corridor 30 reaches the position (Figure 4C) in which the aperture 31 exceeds the level of the material M and all the material M' is discharged back into the chamber 11.

[0027] Consequently none of the material M is discharged out of the chamber 11 through the corridor 30. To evacuate any residue R from the chamber 11, the container 10 is rotated in the opposite direction (clockwise), i.e. in the direction from the second end 30" towards the first end 30'. When the aperture 31 reaches the residual material R contained in the chamber 11, the material R penetrates into the corridor 30 through this aperture by gravity. As rotation proceeds, the second end 30" descends with respect to the first end 30' and the corridor 30 becomes increasingly filled with material R' originating from the chamber 11 (Figure 5B). Finally, with the second end 30" moving downwards, the material R' contained in the corridor 30 is discharged completely through the mouth 32, to the outside of the chamber 11.

[0028] In practice, with just a few revolutions of the container 10 in the clockwise direction, all residue is discharged from the chamber 11. This is achieved automatically without it being necessary to open and reclose doors or the like.

[0029] In addition to discharging the residue, the invention can be used to completely discharge the entire material processed in the chamber 11.

[0030] Numerous modifications of a practical and applicational nature can be made to the invention, but without departing from the scope of the inventive idea as claimed below.

Claims

1. A mechanical mixer, comprising:

a container (10) enclosing a mixing chamber (11) having a cylindrical wall (12), the axis (A) of which is horizontal or nearly horizontal,
means for rotating the container (10) in both directions about said axis (A),
mixing of the material being carried out within said mechanical (11) of the container,

characterised by comprising, for discharging material from the rotating container (10),

a corridor (30) which, provided on the outer surface of the cylindrical wall (12), extends through an arc of the cross-section of the wall (12), and has a first end (30') communicating with the mixing chamber (11) via a passage aperture (31) provided in the cylindrical wall, and a second end (30") open towards the outside environment,
said corridor (30) having a length such that, when said passage aperture (31) of the first end (30') is encountered by the material contained in the mixing chamber (11), the second end (30") lies at a level higher than the level of the material which enters the corridor (30),
the container (10) being rotated in the direction from the second end (30") towards the first end (30') to discharge material from the chamber (11) via said corridor (30), and in the opposite direction during the mixing stage.

2. A mixer as claimed in claim 1, **characterised in that** said corridor (30) has a relatively small constant radial dimension and an axial dimension which at a first end (30') equals virtually the entire axial dimension of the mixing chamber (11).

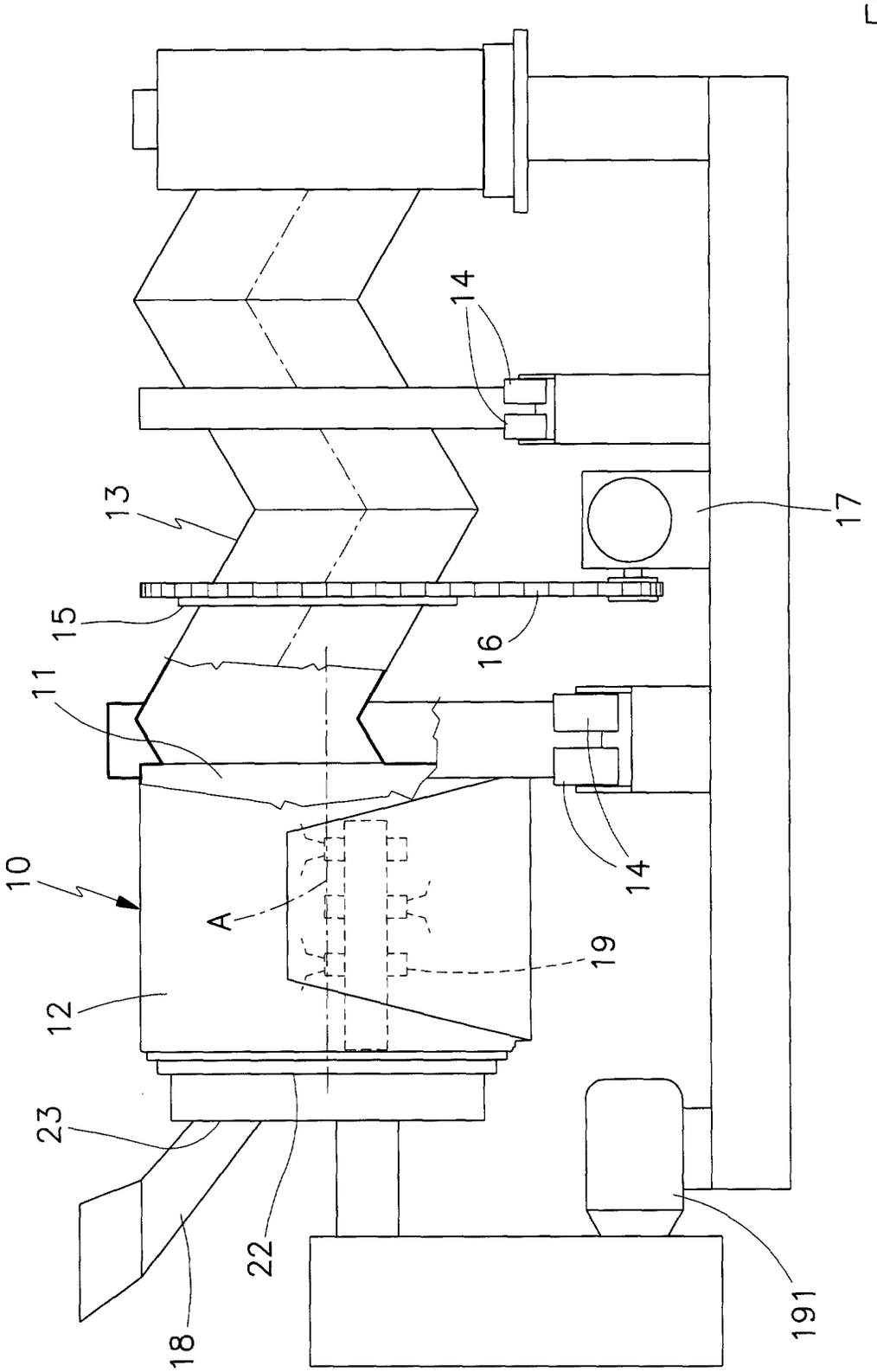


FIG.1

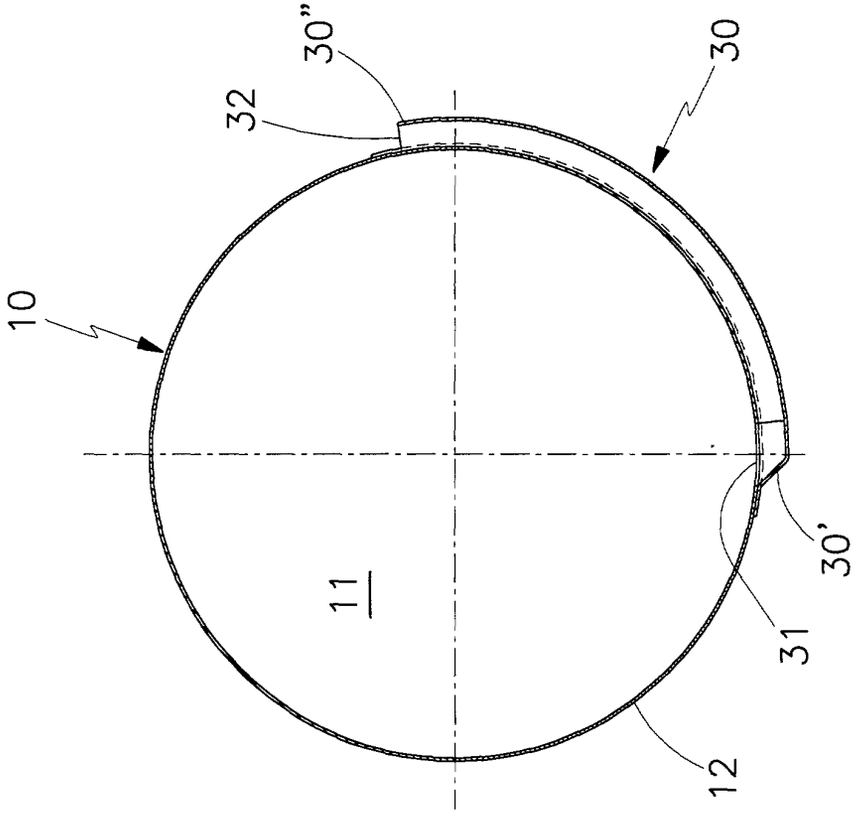


FIG.3

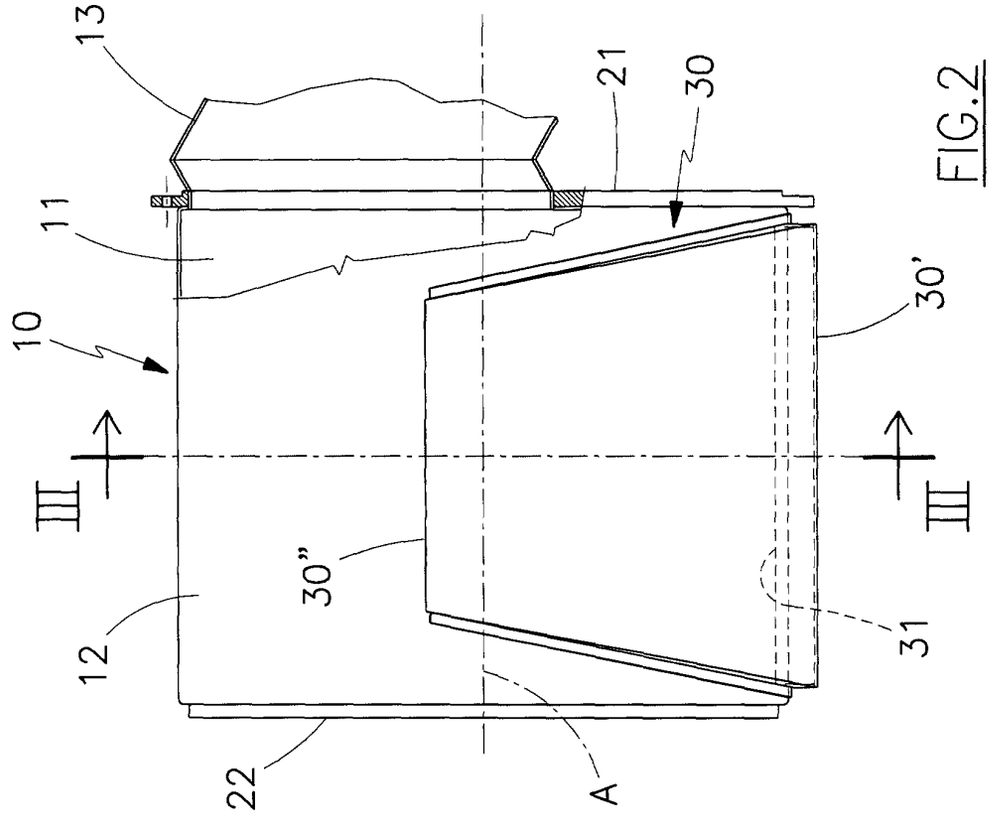
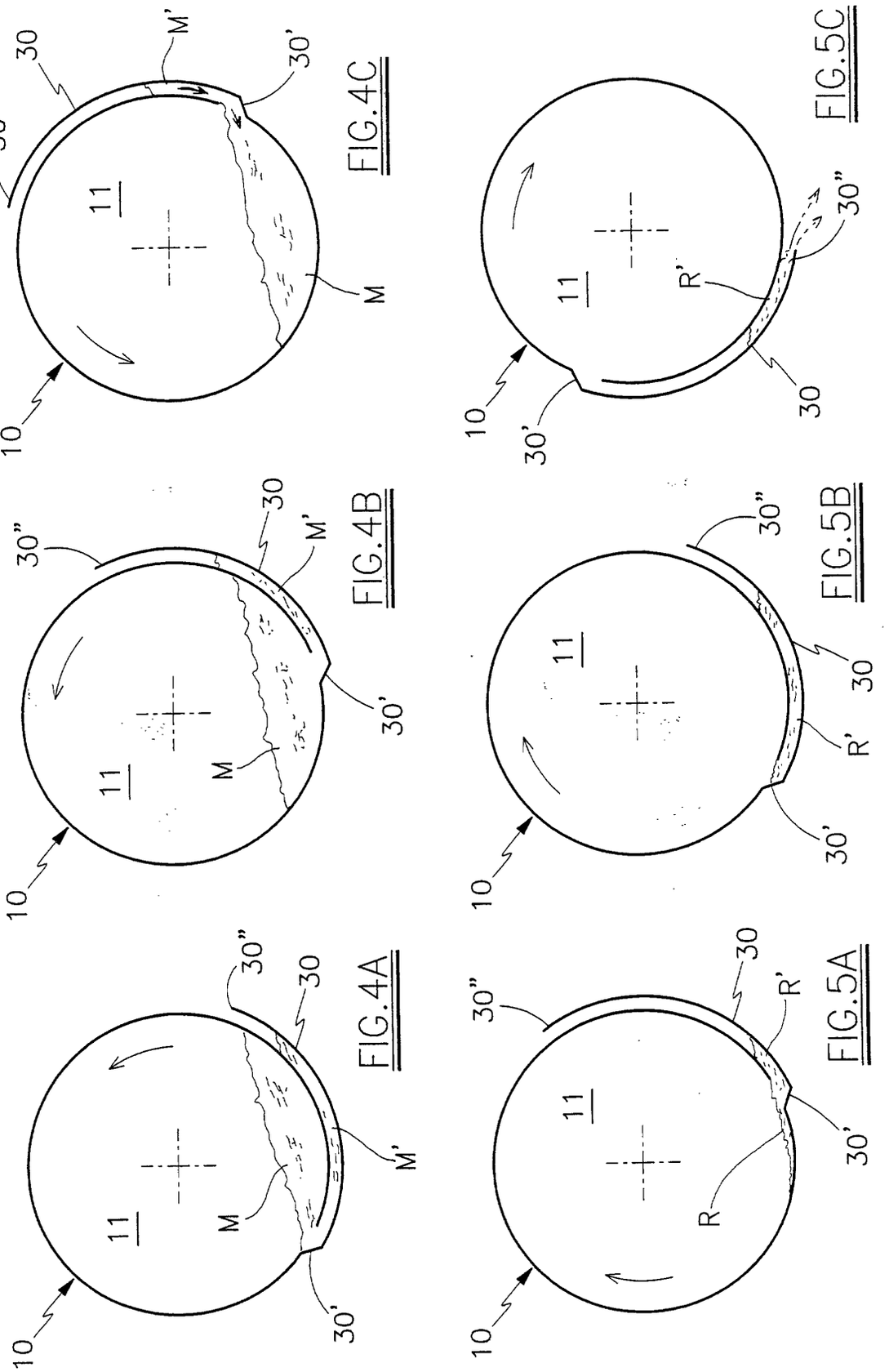


FIG.2


10
11
30"
30
30'
M
M'
FIG.4A
FIG.4B
FIG.4C
R
R'
FIG.5A
FIG.5B
FIG.5C