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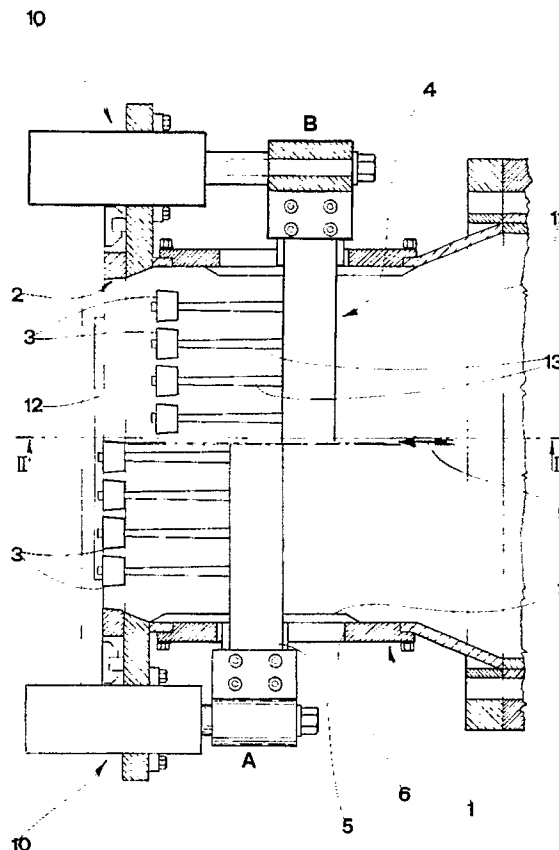
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I-41100 Modena(IT)(54) **An extruder, in particular for shaping items with totally enclosed internal cavities.**

(57) In an extruder capable typically of shaping clay into hollow items such as tiles, building blocks, refractories, etc., the raw material is forced along a tubular casing (1) of which the opening at the outlet end is surrounded by a frame (2) with a continuous rim. The hollow profile is produced by core pieces (3) mounted to a support that can be moved back and forth along the flow direction of the material between a forward limit position, in which the core pieces are aligned with the frame and produce voids in the extruding material, and a retracted limit position in which the core pieces are distanced and an extruded form of solid cross section is obtained; thus it becomes possible to encapsulate the voids in the surrounding material.

Fig.2**EP 0 417 053 A2**

The present invention relates to an extruder, in particular for the production of items with totally enclosed internal cavities.

Such an extruder is intended specifically, though by no means exclusively, for the moulding of clays into tiles, bricks, refractories and other related products.

The prior art in this field embraces the shaping of hollow items (such as building blocks) by means of an extruder essentially comprising a tubular casing into which the material for extrusion is directed, and associated with the outlet end of the casing, a frame serving to establish a continuous rim around the opening through which the material is forced; the extruder also comprises a plurality of core pieces positioned in alignment with the rim, i.e. occupying the same transverse plane as the outlet, and supported by a structure positioned preceding the frame in the direction of the flow of material, internally of the tubular casing. The inclusion of such core pieces reflects the conventional method by which holes, or voids, are formed in extruded items of the type in question.

The hollow item extruded by this method is formed with longitudinal internal cavities, and presents a right cross section, i.e. perpendicular to the direction of extrusion, that appears constant and with a characteristically pierced pattern produced by the geometry of the core pieces in the outlet. The continuous form thus extruded is cut to obtain discrete items (blocks and such like) of which the longitudinal voids emerge at two opposite faces, i.e. the two faces across which the two separating cuts are made.

The initial object of the present invention is to allow of manufacturing discrete extruded items with totally enclosed longitudinal voids, that is, with internal cavities that do not emerge at the two cut end faces.

A further object of the invention is to provide an extruder designed not only in such a manner as to afford the facility of producing discrete extruded items with totally enclosed internal voids, but also to permit of varying the contour established by the outlet frame during the extruding operation, and thus invest the lateral surfaces of extruded items with recessed profiles extending parallel to the direction of extrusion.

The stated objects are realized with an extruder as characterized in the appended claims, which besides advantageously enabling the formation of a discrete item incorporating internal cavities but without any opening in any external face, and in particular the surfaces disposed transversely to the direction of extrusion, affords the additional advantage that external cavity profiles can be formed on at least one side of the item as part of the same extruding operation, disposed parallel

with the direction of extrusion, in which to insert a variety of facing materials such as timber, marble, rubber etc... The extruder according to the invention can thus be used to advantage in the manufacture of components in terracotta or brick, etc., for the construction of floors, steps, sills, benches and so forth. The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

-fig 1 is a sectional illustration of the extruder taken through II-II in fig 2 in which, for the sake of simplicity, two symmetrical halves divided by a longitudinal median plane are shown in different operating configurations;

-fig 2 is a sectional illustration of the extruder taken through I-I in fig 1 in which, analogously, two symmetrical halves divided by a longitudinal median plane are shown in two different operating configurations;

-fig 3 is the cutaway illustration of a building block obtainable by means of the extruder of figs 1 and 2, viewed in section through IV-IV of fig 4;

-fig 4 is a cutaway illustration of the block of fig 3, viewed in section through III-III.

With reference to the drawings, 1 denotes a tubular casing, in its entirety, incorporating an inlet 11 through which material for extrusion is directed, and an outlet carrying a peripheral frame 2 that serves to establish a continuous rim around the opening through which the material is obliged to pass under the force of extrusion. 3 denotes one of a plurality of core pieces stably attached by way of relative shanks 13 to a support structure 4 accommodated internally of the tubular casing 1. The function of these core pieces, conventionally, is to permit of forming longitudinal voids in the extruding material which, forced in the direction of the arrow denoted 9, is obliged to pass through the outlet by way of the empty spaces remaining between the core pieces 3 and within the compass of the frame 2. The support structure 4 is not fixed, but capable of movement together with the entire assembly of rigidly associated core pieces 3 back and forth along the direction of extrusion, denoted by the arrow 9, from a position A in which the core pieces 3 are aligned with the frame 2 in such a way as to produce the pierced type of formation, and a retracted position B in which the core pieces are distanced somewhat along the longitudinal extruding direction from the plane occupied by the frame 2. In effect, the position denoted B is designed to set a gap between the transverse plane of extrusion occupied by the frame 2 and the core pieces 3 such that the core pieces play no part in shaping the internal area of the extruded pattern; accordingly, the extruder outlet remains free, circumscribed only by the continuous rim of the

frame 2, and can be filled completely by the material.

The support structure 4 is traversed parallel with the direction of extrusion by power cylinders 10 positioned externally of the tubular casing 1, and for this purpose is provided with appendages 5 that project externally from the casing on either side, each slidably accommodated by a longitudinal slot 6 formed in the casing parallel with the direction of extrusion (see fig 2). 7 denotes a plate associated rigidly with each appendage 5 and disposed flush with the internal surface of the tubular casing 1, the dimensions of which are such as to mask the relative slot 6 completely, whatever the position of the appendage 5.

12 denotes one of two blades disposed symmetrically on either side of the plane denoted I-I (fig 1) along the longer sides of the frame 2; the blades are capable of movement in relation to the frame, and serve essentially as adjustable elements by means of which to modify the contour of the rim surrounding the extruder outlet, according to the position assumed in relation to the frame 2.

More exactly, the two blades 12 can be moved in a direction perpendicular or at least transverse to the extruding direction, between two positions denoted A¹ and B¹. When in the B¹ position, the blades 12 are located outside the contour of the rim of the opening defined by the frame 2 alone, and therefore make no contact with the extruding material passing through the opening; conversely, the desired contact is achieved with the blades in the A¹ position. The two blades 12 are associated mechanically with the core support structure 4 by means of respective articulated linkages 14 each comprising a rod 15 and a lever 16 interconnected by a bell-crank lever 17 rotatable about a fixed pivot 18. The linkages 14 serve to transmit the traversing movement of the support structure 4 to the two blades 12, and thus to convert the axial motion of the former, parallel with the extruding direction, into transverse motion of the latter, normal to the extruding direction. The linkage is arranged such that with the support structure 4 in position B the blades 12 will occupy position B¹, and with the support structure 4 in position A the blades will occupy position A¹.

In the embodiment illustrated, the length of the blades 12 is less than that of the sides of the frame 2 with which they are associated.

In position B, with the core pieces 3 distanced from the frame 2, the cross section of the opening remains free and can be occupied completely by the emerging material; accordingly, it becomes possible to extrude an item of entirely solid cross section, and with the blades 12 positioned outside the path of the emerging material, the external outline of the extruded item will match the contour

of the frame 2.

By operating the cylinders 10 at a selected moment, and at any given speed, the support structure 4 can be transferred from position B to position A, and the blades 12 from position B¹ to position A¹. This same movement causes the core pieces 3 to advance gradually toward the outlet, engaging progressively with the flow of material until finally reaching position A in alignment with the frame 2, at which point their physical presence has the effect of forming internal cavities or voids, denoted 19, in the emerging mass. In addition to the action of the core pieces 3 on the internal area of the extruded section, the contour of the opening afforded by the frame 2 is also modified by the blades 12 in such a way as to form the external recesses 21. With the extruder in this configuration, the cross section of the emerging form appears with the pierced and recessed pattern of fig 4.

Effecting the opposite manoeuvre, whereby the core piece support structure 4 is moved from position A to position B and the blades from A¹ to B¹, the pierced and recessed pattern described above will be replaced gradually by a solid cross section of which the external outline corresponds to the full contour of the frame 2.

By moving the core pieces 3 and blades 12 forward and back once, as described above, between each two cuts made through the continuously extruding form, one obtains a succession of discrete extruded items of the type illustrated in figs 3 and 4. Observing the item in question, denoted 20 in its entirety it will be seen that the two end faces 22 disposed transversely to the direction of extrusion emerge unpierced, notwithstanding the formation of the longitudinal voids 19 internally; in addition, two of the faces disposed parallel to the extruding direction emerge each with a respective recess 21 formed by the action of the blades 12. These same external recesses 21, which will be of shape and dimensions dependent substantially on the selected shape and dimensions of the respective blades 12, can be incorporated advantageously to receive any one of a variety of building and/or interior design materials such as wood, carpet, marble, rubber, etc...

Claims

1) An extruder, in particular for the shaping of items with totally enclosed internal voids, comprising a tubular casing (1), a frame (2) associated with the outlet end of the casing and serving to establish a continuous rim around the opening through which the extruding material is forced, and a plurality of core pieces (3) carried by a support structure (4) accommodated internally of the tubular casing

(1), characterized

in that the core pieces (3) are capable of movement back and forth along the direction of extrusion between a position of alignment with the frame (2), in which the single core piece (3) combines with the frame to determine the geometry of an extruded section comprising an internal area of pierced appearance, and at least one further position distanced from the frame (2), in which the single core piece (3) plays no part in determining the geometry of the internal part of the extruded section and the area encompassed by the frame (2) thus remains free to be occupied entirely by the extruded material.

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2) An extruder as in claim 1, comprising a plurality of core pieces (3) rigidly associated with a support structure (4) that is traversed back and forth in a direction parallel to the extruding direction by cylinders (10) located externally of the tubular casing (1), wherein the structure (4) is connected to the moving parts of the cylinders by way of appendages (5), projecting externally from the tubular casing and accommodated slidably in respective longitudinal slots (6) afforded by the casing and disposed parallel with the direction of extrusion, each of which is rigidly associated with a relative plate (7) offered flush to the internal surface of the casing (1) and proportioned such as to ensure that the corresponding slot (6) remains entirely covered and thus impenetrable whatever the position assumed by the appendage (5).

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3) An extruder as in claim 1, comprising at least one element or blade (12) closely associated with and capable of movement in relation to the frame (2), by means of which the contour of the continuous rim around the opening afforded by the frame can be modified according to the relative position of blade and frame.

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4) An extruder as in claim 3, wherein the blade (12) is capable of movement back and forth transversely to the direction of extrusion, and its position in relation to the frame (2) is interlocked to the position of the core pieces (3) and their rigidly associated support structure (4) in relation to the frame (2).

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5) An extruder as in claim 4, wherein the core piece support structure (4) and the blade (12) are interconnected by means of an articulated linkage comprising adjustable rods and levers.

6) An extruder as in claim 5, comprising two blades (12) symmetrically disposed and associated with two opposite sides of the frame (2).

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Fig.1

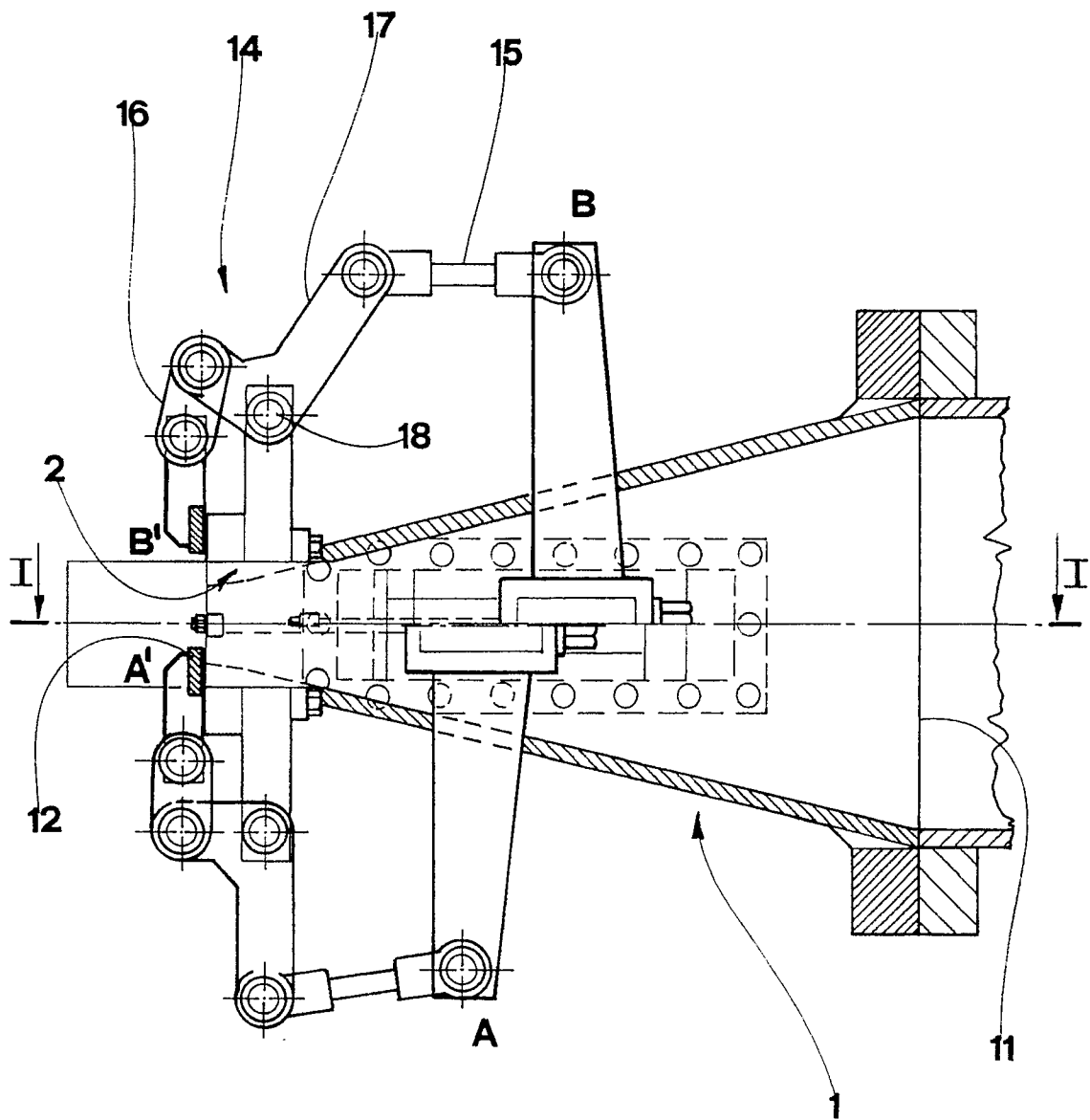


Fig.2

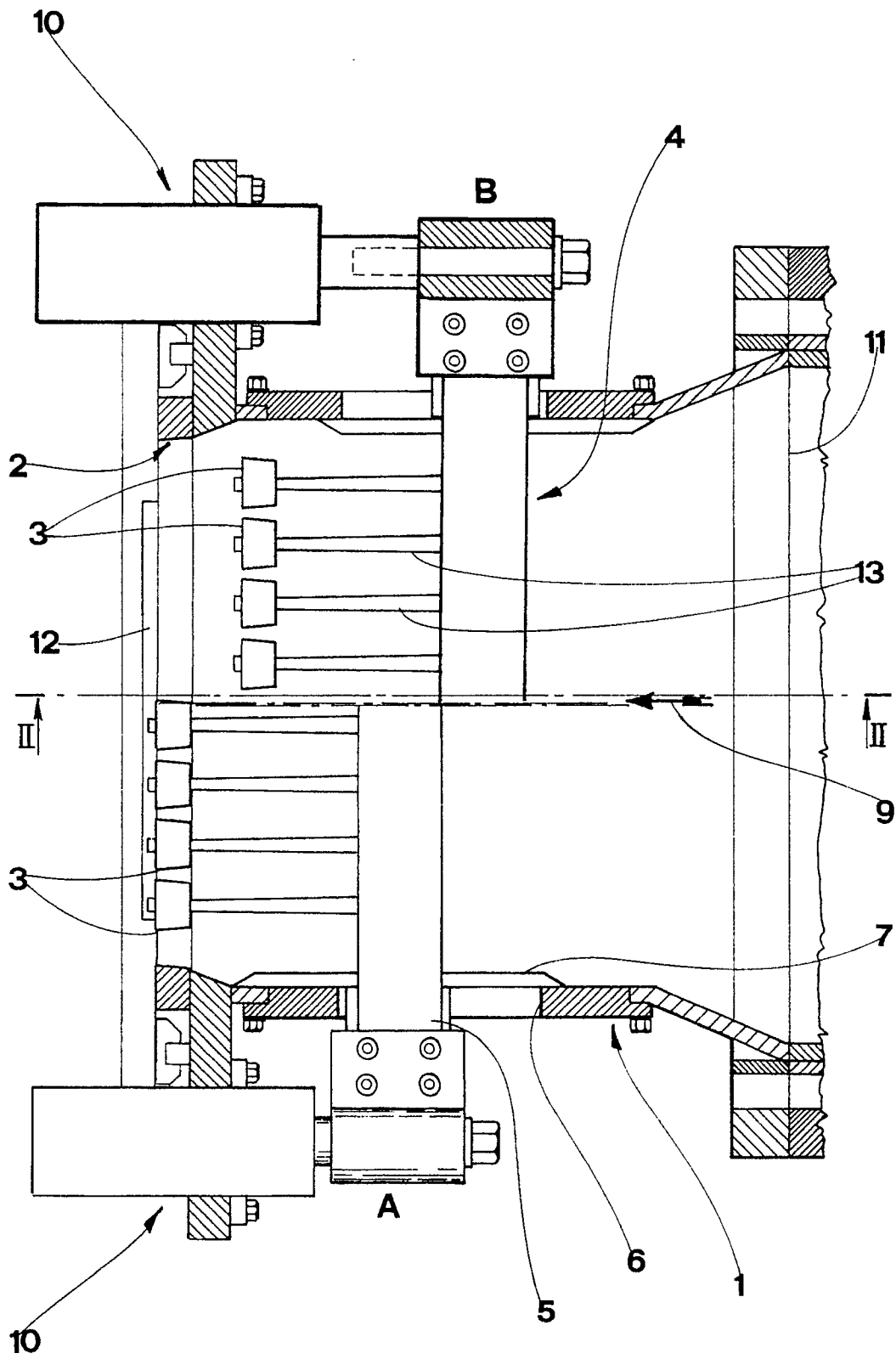


Fig.3

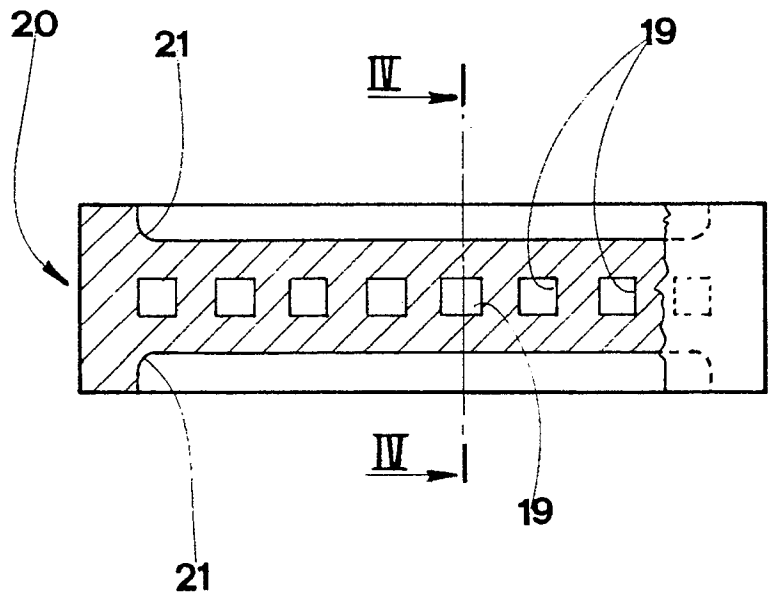
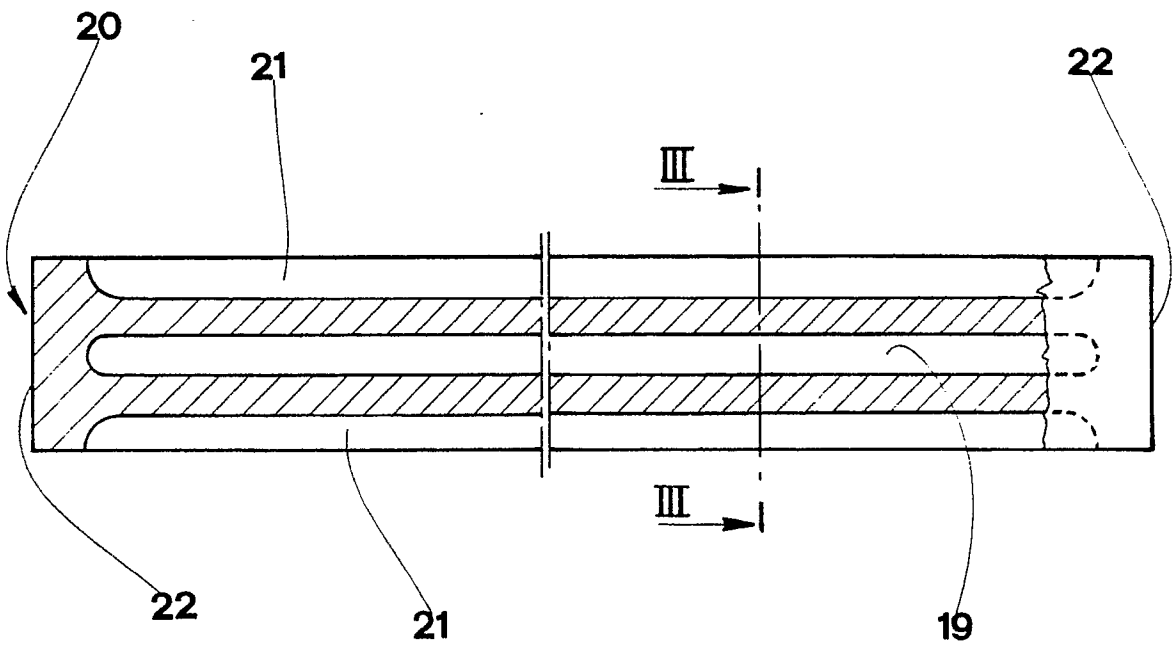


Fig.4