A reversible, thermo-acoustic panel intended for a reversible, thermo-acoustic "disposable" variable-geometry formwork, made up of one vertical body featuring one upper surface and one lower surface, both of them defining such body, the upper surface being equipped with a plurality of engaging teeth and/or recesses and the lower surface being equipped with a plurality of such engaging teeth and/or such engaging recesses corresponding with such engaging teeth and/or such recesses of the upper surface, such plurality of engaging teeth and/or engaging recesses being geometrically arranged according to a grid made up of the crossing between one first distribution mode and one second distribution mode relative to such teeth and/or such recesses.
REVERSIBLE, THERMO-ACOUSTIC PANEL FOR REVERSIBLE, VARIABLE-GEOMETRY FORMWORK

[0001] This invention pertains to a reversible, thermo-acoustic panel intended for variable-geometry formwork.

[0002] Notedly, a formwork is a structure used in the building and construction trade to build the reinforced concrete works. It provides a casing into which the additional concrete in the liquid state is cast, after the reinforcement irons have been properly positioned, where the concrete stays until the completion of the setting process and after the cast has, once the hardening phase has started, achieved such mechanical strength as to guarantee the absorption of the stress which the structure has to withstand soon after the formwork itself has been taken apart.

[0003] Formworks can be made of several materials; in particular, formworks are currently available, which are made up of polystyrene foam panels made by means of the technique generally referred to as Insulated Concrete Form (ICF), as well as of their respective spacing connectors, which are disposable items needed for the assembling and internal blocking of the various aforesaid panels making up the shuttering mould of a reinforced concrete wall.

[0004] In particular, the existing polystyrene panels feature, along their upper and lower edges, a plurality of engaging teeth and/or corresponding recesses suited to allow several such panels to be connected by stacking. The arrangement of such known teeth and recesses makes, however, it possible to connect such panels by stacking in mutually co-planar or orthogonal positions, whereas as regards their mutual connection at different angles, special connectors shall be used, which require some time in order to be installed.

[0005] Moreover, all of the formwork systems featuring polystyrene foam panels pose serious transpiration problems, which may lead to building reinforced concrete construction structures that will, especially in case of civil buildings, give rise to the well-known causes of SDS (Sick Building Syndrome).

[0006] Furthermore, the “disposable” formwork systems featuring polystyrene foam panels, generally referred to by the term “Insulated Concrete Form” (ICF), of American or Canadian origin, still pose sound-proofing problems since they are not able to adequately break and dissipate the noise from the outside.

[0007] Thus, the aim of this invention is to solve the above-mentioned problems relative to the older “Insulated Concrete Form” (ICF) method, by providing a reversible, thermo-acoustic panel for thermo-acoustic, disposable variable-geometry formwork, which will make it possible to connect several panels themselves by stacking, both in mutually co-planar or orthogonal positions and in mutually sloping positions.

[0008] One further aim of this invention is to provide a reversible, thermo-acoustic panel for thermo-acoustic, “disposable” variable-geometry formwork, equipped with lock-in profiles that will make it possible to insert junction bridges both inside and outside the formwork featuring multiple pitches of 1.25 cm and 2.5 cm.

[0009] One further aim of this invention is to provide a reversible panel for thermo-acoustic, “disposable” variable-geometry formwork, which will be able to create several formworks joined to one another through variable sections, in order to contribute either structurally joint or separated from one another according to calculation needs.

[0010] Furthermore, one aim of this invention is to provide a reversible, thermo-acoustic panel for thermo-acoustic, “disposable” variable-geometry formwork, equipped with lock-in profiles that will make it possible to insert elements of the IPE or “I” type as well as the assembling, inside and/or outside, of ventilated walls or any other panel, by guaranteeing the structural strength thereof even in seismic areas.

[0011] One further aim of this invention is to provide a reversible, thermo-acoustic panel for thermo-acoustic, “disposable” variable-geometry formwork, equipped with lock-in profiles that will make it possible to insert any one structural element of the ICF systems available on the market, and also the various profiles made of steel alloy, aluminum and structural fibre-composite plastics produced especially for structural needs, with no shape constraint at all.

[0012] One further aim of this invention is to provide a reversible panel for thermo-acoustic, “disposable” variable-geometry formwork, equipped with lock-in profiles that will make it possible to insert any one structural element, that is to say, oblong profiles made of steel alloy, aluminum and structural fibre-composite plastics produced especially for structural needs, with no shape constraint at all, including reticular brackets to be fitted as a constraint to the profiles themselves, both at the bottom and the top.

[0013] Moreover, one further aim of this invention is to provide a reversible, thermo-acoustic panel for thermo-acoustic, “disposable” variable-geometry formwork, which will make it possible to facilitate the transpiration process inside the formwork itself.

[0014] Furthermore, one aim of this invention is to provide a reversible, thermo-acoustic panel for thermo-acoustic, “disposable” variable-geometry formwork, which will make it possible to obtain better sound-proofing of the formwork itself during the entire service life thereof.

[0015] The above and the other aims and advantages of the invention, as detailed in the description hereafter, will be obtained by means of a reversible, thermo-acoustic panel for reversible, thermo-acoustic “disposable” variable-geometry formwork, like the one described under claim 1. Preferred embodiment designs and original variants of this invention will be the object of the relevant claims.

[0016] It is obvious that a number of variants and modifications can be made to the described items (e.g. variants and modifications concerning the dimensions, that is to say, height, length and thickness, and also the shape, as well as the arrangements and the parts performing similar functions) without departing from the scope of protection of the invention, as referred to in the enclosed claims.

[0017] This invention will be best described by a few preferred embodiments, which will be provided by way of example and with no limitation thereto, with reference to the enclosed drawings, in which:

[0018] FIG. 1 shows perspective top views of a few preferred embodiments of the reversible, thermo-acoustic panel for reversible, thermo-acoustic “disposable” variable-geometry formwork in accordance with the present invention;

[0019] FIG. 2 shows plan views of the reversible thermo-acoustic panels shown in FIG. 1;

[0020] FIG. 3 shows a front view of a reversible, thermo-acoustic panel shown in FIG. 1;

[0021] FIG. 4 shows a side view of a reversible, thermo-acoustic panel shown in FIG. 1;
FIG. 5 shows an enlarged view relative to the detail of box ‘A’ of the reversible, thermo-acoustic panel shown in FIG. 1.

FIG. 6 shows a plan view of another preferred embodiment of the reversible, thermo-acoustic panel in accordance with the present invention.

FIG. 7 shows a perspective top view of a plurality of reversible thermo-acoustic panels in accordance with the present invention, in a possible assembling configuration, used for making a reversible, thermo-acoustic “disposable” variable-geometry formwork.

FIG. 8 shows a perspective top view of a plurality of reversible thermo-acoustic panels in accordance with the present invention, in another possible assembling configuration, used for making a reversible, thermo-acoustic “disposable” variable-geometry formwork.

FIGS. 9 to 12 show perspective views of other preferred embodiments of the reversible thermo-acoustic panels referred to in the present invention, in their operating configurations.

FIGS. 13 and 14 show perspective views of an application of the inventive reversible, thermo-acoustic panel used for supporting structural, ornamental capitals free from thermal bridges, integrating connectors, oblong rod elements and structural brackets with an additional reinforced concrete cast.

FIGS. 15 to 19 show perspective views of other preferred embodiments of the reversible thermo-acoustic panels referred to in the present invention, in their operating configurations.

By referring to the Figures, you can notice that the reversible, thermo-acoustic panel 1 intended for reversible, thermo-acoustic “disposable” variable-geometry formwork, as referred to in the present invention, is made up of a vertical body 3 featuring one upper surface 5 and one lower surface 7, both of them delimiting such body 3, said upper surface 5 being equipped with a plurality of engaging teeth 9 and/or engaging recesses 10, and said lower surface 7 being equipped with a plurality of such engaging teeth and/or such engaging recesses corresponding with such engaging teeth 9 and/or engaging recesses 10 of upper surface 5.

As you can notice in FIG. 5 in particular, such plurality of engaging teeth 9 and/or engaging recesses 10 is geometrically arranged in accordance with a grid made up of the crossing between one first distribution mode and one second distribution mode relative to said teeth 9 and/or recesses 10: in particular, the first distribution mode consists of a plurality of first rows 11 of such teeth 9 and/or recesses 10 placed side by side in parallel and also inclined by an angle \( \alpha \) relative to the longitudinal plane L-L of panel 1, such angle \( \alpha \) being preferably equal to 45°.

Furthermore, the second distribution mode consists of a plurality of second rows 13 of such teeth 9 and/or recesses 10 placed side by side in parallel and also perpendicular to the longitudinal plane L-L of panel 13, such second rows 13 being mutually offset by at least the width of one such tooth 9 and/or recess 10.

The reversible, thermo-acoustic panel 1 referred to in the present invention and described above will therefore make it possible to connect several panels 1 themselves by stacking, by locking together the engaging teeth 9 and/or the recesses of the respective upper surfaces 5 and lower surfaces 7 both in mutually co-planar or orthogonal positions and in positions mutually inclined by the aforesaid angle \( \alpha \); please note that if \( \alpha=45° \), panels 1 can be stacked onto one another in parallel by subtending 45° angles among the respective longitudinal planes L-L.

In addition, vertical body 3 may be equipped with a plurality of first all-purpose lock-in profiles 15, preferably featuring a male or female dovetail shape, suited to make it possible to connect the reversible, thermo-acoustic panel 1 referred to in the present invention with any other structural element needed for assembling a reversible, thermo-acoustic “disposable” variable-geometry formwork, such as, for instance, spacing connectors, other panels 1 or made from known methods, ventilated panels, junction bridges, and so on, usually employed in the building and construction trade. Please note that such first all-purpose lock-in profiles 15 are productively arranged preferably in a vertical direction, on at least both of the side walls of body 3 in such a manner that the aforesaid structural elements can be connected both inside and outside to the reversible, thermo-acoustic “disposable” variable-geometry formwork made up of such reversible thermo-acoustic panels 1.

Still more preferably—and in order to allow full reversibility of the panel 1 referred to in the present invention—at least one first wall of body 3 is equipped with a plurality of first all-purpose lock-in profiles 15 featuring a male dovetail shape, whereas the second wall of body 3 opposite the first one is equipped with a corresponding plurality of first all-purpose lock-in profiles 15 featuring a female dovetail shape, so as to allow co-planar connection of several panels 1 referred to in the present invention, without having to use other external connecting elements. Thus, by connecting two or several reversible thermo-acoustic panels 1 referred to in the present invention with one another and, if necessary, by connecting also other layers made of different materials (such as, for instance, bricks, shards, stone, and so on) with one another, the formwork wall thickness can be increased and, also, an increase can be achieved in the noise breaking along the junction lines among such reversible thermo-acoustic panels 1.

In addition, the vertical body 3 may be equipped with a plurality of second lock-in profiles 17, the latter too being preferably arranged in a vertical direction, suited to make it possible to insert elements of the IPE or “T” types 19. Obviously, such elements 19 may be made of any one material suitable for the purpose, for instance, steel, another metal or plastic materials. As an alternative—and in order to obtain significant weight reduction—such elements 19 may be made of a composite material such as, for instance, carbon fibre.

In addition, at least the lower surface 7 of body 3 of panel 1 referred to in the present invention may be equipped with at least one first transpiration groove 21 parallel with the longitudinal plane L-L, which will make it possible to form a transpiration grid when several panels 1 referred to in the present invention are stacked onto one another. Obviously, it can be anticipated that also the upper surface 5 of body 3 of the reversible, thermo-acoustic panel 1 referred to in the present invention will be equipped with at least one second transpiration groove 23 parallel with the longitudinal plane L-L, pursuing a similar technical aim.

The vertical body 3 (obviously featuring varying shapes, thicknesses and forms to adapt to the various building and construction requirements known in the building trade) shall preferably be made of polystyrene foam suitable for use according to the Insulated Concrete Form (ICF) method:
obviously, it can be anticipated that the vertical body 3 will be made of any other material (which may be a plastic one) suitable for the purpose, without therefore departing from the scope of protection of this invention.

Furthermore, the body 3 of the reversible, thermo-acoustic panel 1 may obviously feature any one shape relative to its plan other than the essentially rectangular one shown in FIGS. 1 and 2. In fact, as you can notice in FIG. 6 by way of example, the reversible, thermo-acoustic panel 1 referred to in the present invention may be adapted to an angular element, such that it will connect with other thermo-acoustic panels 1 by means of the respective lock-in profiles and also determine the final closing of a reversible, thermo-acoustic “disposable” variable-geometry formwork.

Obviously, as you can notice in FIGS. 7 and 8 by way of example, the mutual connection and/or the stacking of a plurality of reversible thermo-acoustic panels 1 referred to in the present invention make it possible to make, in a simple, cost-effective, quick and convenient manner, any one formwork 30 featuring the desired dimensions and shapes (even complex ones).

Furthermore, by thus connecting two or several panels 1 referred to in the present invention with one another and, if necessary, by connecting also other layers made of different materials (such as, for instance, raw bricks, shards, stone, and so on) with one another, the thickness of the walls of reversible, thermo-acoustic “disposable” variable-geometry formwork 30 can be increased and, also, an increase can be achieved in the noise breaking along the junction lines among such panels 1.

In addition, the vertical body 3 may be equipped with a plurality of surface score lines arranged by multiple pitches, in order to be able to be partitioned to measure by mere manual effort.

FIGS. 9 to 12 and 15 to 19 show perspective views of other preferred embodiments of panels referring to this invention, in their operating configurations. These Figures show two pairs of panels 1, placed side by side and separated by a plurality of brackets 80 and a plurality of spacers 82, both brackets 80 and connectors 82 being supported by a plurality of connectors 81 and also being suited to support respective reinforcement iron 84. FIG. 16 shows, moreover, a configuration featuring new conical supports 86 for orientation and diagonal arrangement of iron 84.

Finally, FIGS. 13 and 14 show perspective views of an application relative to the inventive reversible, thermo-acoustic panel 1 for the ornamental, monolith capitals 100, the latter being preferably made of polystyrene foam, too.

1. A reversible, thermo-acoustic panel for variable-geometry formwork, made up of one vertical body featuring one upper surface and one lower surface, both of them delimiting said body, said upper surface being equipped with a plurality of engaging teeth and/or recesses and said lower surface being equipped with a plurality of said engaging teeth and/or said engaging recesses corresponding with said engaging teeth and/or said engaging recesses of said upper surface, said plurality of engaging teeth and/or engaging recesses being geometrically arranged according to a grid made up of the crossing between one first distribution mode and one second distribution mode relative to said teeth and/or recesses, wherein said vertical body is equipped with a plurality of first all-purpose lock-in profiles suited to make it possible to connect said panel with any other structural element needed for assembling said formwork, each of said first all-purpose lock-in profiles featuring a male or female dovetail shape.

2. The reversible, thermo-acoustic panel in accordance with claim 1, wherein at least said lower surface of said body is equipped with at least one first transpiration groove and said upper surface of said body is equipped with at least one second transpiration groove.

3. The reversible, thermo-acoustic panel in accordance with claim 1, wherein said first distribution mode is made up of a plurality of first rows of said teeth and/or said recesses placed side by side in parallel and inclined by an angle relative to a longitudinal plane L-L of said panel, and that said second distribution mode is made up of a plurality of second rows of said teeth and/or said recesses placed side by side in parallel and perpendicular to said longitudinal plane L-L, said second rows being mutually offset by at least the width of one said tooth and/or said recess.

4. The reversible, thermo-acoustic panel in accordance with claim 3, wherein α=45°.

5. The reversible, thermo-acoustic panel in accordance with claim 1, wherein said first all-purpose lock-in profiles are arranged, preferably in a vertical direction, on at least both of the side walls of said body.

6. The reversible, thermo-acoustic panel in accordance with claim 5, wherein at least one first wall of said body is equipped with a plurality of said first all-purpose lock-in profiles featuring a male dovetail shape, whereas one second wall of said body opposite said first wall is equipped with a corresponding plurality of said first all-purpose lock-in profiles featuring a female dovetail shape.

7. The reversible, thermo-acoustic panel in accordance with claim 1, wherein said vertical body is equipped with a plurality of second lock-in profiles, preferably arranged in a vertical direction, suited to make it possible to insert elements of the IPE or “T” type.

8. The reversible, thermo-acoustic panel in accordance with claim 1, wherein said vertical body is equipped with a plurality of surface score lines arranged by multiple pitches.

9. The reversible, thermo-acoustic panel in accordance with claim 1, wherein it is suited to be operatively connected with another panel by placing a plurality of brackets and/or a plurality of connectors in between, both such brackets and such connectors being supported by a plurality of connectors and being suited to support respective oblong reinforcement irons.

10. The reversible, thermo-acoustic panel in accordance with claim 9, wherein it also features a plurality of conical supports for orientation and diagonal arrangement of said reinforcement irons.

11. The reversible, thermo-acoustic panel in accordance with claim 1, wherein it is suited to support ornamental capitals made of polystyrene foam, said capitals including continuous insulating leather and being suited to contain the additional concrete cast.