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(54) **Lightweight formwork plate and its use for the formation of ceilings and walls**

(57) The thinned formwork plate comprised by a section or base layer of plaster on which a section or layer of thinned concrete (2) is placed, bonded to the former on which thinning materials have been added, preferably of a volcanic type, perlite type, vermiculite and equivalents, as well as several bonding mortars or mortar additives which provide the concrete with greater adher-

ence, coercitivity, and impermeability between the particles of the concrete itself and with the plaster plate, achieving a plate which lacks grooves or ribs in its upper section to favour its grip with the ironwork concrete, as well as means of interior reinforcement, such as for example the corrugated steel framework.

EP 1 867 800 A1

Description

OBJECT OF THE INVENTION

[0001] The object of this invention is the thinned formwork plate as well as its use for the formation of ceilings and walls.

[0002] This plate is characterized by its configuration which is comprised by a configuration of two materials laid out in sections or layers, where the first section or layer of plaster is placed on thinned concrete properly joined to the front plaster section.

[0003] This invention is characterized by the special nature of the thinned concrete used in the manufacture of the formwork plate, as well as the fact of not requiring any interior reinforcements some placed in an embedded manner in the interior of the thinned concrete mass.

[0004] This invention is equally characterized by its special properties as thermal, acoustic, or fireproof insulation which makes it especially useful as a construction element.

[0005] Consequently, this invention is circumscribed within the scope of construction and in a specific way among the elements used for the construction of ironworks and walls which subsequently serve as means for the formation of ceilings and walls.

BACKGROUND OF THE INVENTION

[0006] In general, for the construction of ironworks, a straining piece is placed comprised by boards which serve as support to the materials that comprise the ironwork, either in a continual slab or using vaults, placing several steel frameworks and pouring the concrete. Once the poured concrete has set, the straining piece is removed, where the lower side which was in contact with the wood boards is the side in direct view. In general, one always proceeds to the subsequent plasterwork of the lower side of the ironwork. This means, after the construction of the ironwork, one must proceed to the plasterwork or the subsequent covering of the lower side of the ironwork.

[0007] Solutions are known which make it possible to prevent the use of wood boards, which are replaced by non-recoverable formwork plates, where once the straining piece is removed, the ceiling is directly formed without the need for subsequent plasterwork.

[0008] A plate used for the purpose described above is that shown in the Spanish Invention patent with application number ES 200401869. This plate is comprised by an exterior layer of plaster on which a layer of thinned and reinforced concrete is placed. In general, this plate has an elevated weight, for which reason it relies on a series of construction features focused on equipping it with better grip and structural resistance.

[0009] These plates, with the object to equip them with better grip to the concrete poured on them, rely on a series of longitudinal grooves or ribs in their upper section

which permit greater coercivity of the poured concrete with the thinned concrete of the plate.

[0010] On the other hand, given that it has a relatively high weight, several corrugated steel reinforcements embedded in concrete have been placed inside the thinned concrete. The presence of these corrugated steel frameworks limits the use of the plate, since it not only seeks to obtain a finished ceiling once the straining piece has been removed, but also to possess an ironworks zone which permits the subsequent implementation of channels to house pipelines with different functions such as pipelines for electrical installations, public address systems, plumbing, heating, etc.

[0011] The implementation of the channels on these plates which possess an interior steel framework is difficult, thus the subsequent advantage derived from the use of these plates is limited.

[0012] Also, the plates described in the aforementioned patent with application number ES 200401869 also have cavities which serve as handles for better hand-grip or grip and manipulation, due to their elevated weight.

[0013] They also have a tongue and grooved perimeter which facilitates the adjustment of the plates with each other, nevertheless this tongue and grooved section is a source of breakage, makes the product more expensive and it has been observed that it is not necessary.

[0014] There is no known plate comprised by a plaster section and a concrete section, which can be used for the manufacture of walls, such that once the plates have been installed as sides or the wall side to be built, this means that the plasterwork is directly performed on the visible side, once the recoverable structure of the formwork has been removed.

[0015] Thus, the object of this invention is to overcome the existing disadvantages in the plate described in application ES 200401869, by seeking a plate that has less weight, which shall facilitate not having to equip it with upper grooves or ribs to provide it with greater grip with the ironwork concrete, as well as to save the placement of the corrugated steel frameworks which give it greater structural resistance, which in turn would involve the possibility to perform subsequent channels, where it also does not possess a tongue and groove perimeter, and furthermore, which can be used as a means of wall construction.

DESCRIPTION OF THE INVENTION

[0016] The object of this invention is a thinned formwork plate, which is basically composed of a section or base layer of plaster, on which there is a section of thinned concrete layer without any interior reinforcement, bonded to the former.

[0017] Both sections or layers are bonded to each other with a bonding mortar during the manufacturing process.

[0018] The upper side of the concrete plate does not

require upper grooves or ribs, since the porosity of the poured concrete is directly sufficient, once it has set, is sufficient to guarantee the grip between the concrete of the plate object of this invention and the ironwork concrete.

[0019] Optionally in order to reinforce the grip between both concrete sections of the plate and the ironwork, a bonding mortar is applied on the concrete of the thinned plate which improves the adherence, impermeability, and coercitivity between both concrete sections, although it is not indispensable.

[0020] On the other hand and given that the thinned concrete of the plate lacks corrugated steel reinforcement embedded in its interior, an additive with self-adhering bonding properties is added to the thinned concrete layer or section, similar to that which we can use to bond the concrete of the plate with the concrete of the ironwork, also seeking greater adherence between the elements of the thinned concrete composition, greater coercitivity, and impermeability.

[0021] Thanks to the self-adhering additives poured in the concrete of the plate, which make it more resistant, this makes it possible to remove the interior steel framework used in other implementations; on the other hand, thanks to the intrinsic nature of the elements used to thin the concrete, which make it lighter than concrete, this prevents having to carry out upper grooves or ribs on the concrete of the plate, to assure its bonding and lift with the ironwork concrete. Thus, it finally achieves a plate which facilitates performing the channels in an easy and simple way.

EXPLANATION OF THE DRAWINGS

[0022] To complement the description which shall be performed below and with the aim to facilitate greater understanding of its characteristics, a set of plans has been attached to this descriptive report whose figures represent the most significant details of the invention in an illustrative but not limited way.

[0023] In figure 1, we can observe a representation in the perspective of a general configuration of the thinned plate object of the invention.

[0024] In figure 2, we observe a representation of the placement of the formwork plates on the straining pieces for an ironwork construction.

[0025] In figure 3, we observe a representation in a perspective where the formwork plates are used for the construction of walls.

PREFERENTIAL IMPLEMENTATION OF THE INVENTION

[0026] In view of the aforementioned figures, the preferential implementation mode of the invention and the explanation of the drawings is described below.

[0027] Figure 1 shows how the thinned plate of the invention has a section or base layer of plaster (1), on

which it is bonded to another section or layer of thinned concrete (2) with greater thickness without any interior corrugated steel framework and bonded to the former.

[0028] Optionally, in the interior of the section or layer of thinned concrete, it is possible to place a mesh or fibres in the case that one seeks greater safety with the objective to prevent the falls of plate fragments in the case of breakage. The presence of these meshes or fibres would not hinder the potential implementation of channels since they are easy to break materials.

[0029] The thickness of the base section of the plaster (1) depends on the structural resistance that it has, which can be reduced in the degree in which fibres are poured in its forming which equip it with greater structural resistance.

[0030] In the case that the thinned formwork plate is used for the formation of ceilings, the section or plate of thinned concrete is slightly shifted in its edges in relation to the edges of the section or base plate of the plaster; this space is filled with the ironwork concrete to be poured which filters in the bond between the plate and the ironwork concrete.

[0031] On the other hand, in the case that the thinned formwork plate is used for the construction of walls, the edges of the section or layer of thinned concrete are at the beams of the edges of the section or layer of plaster.

[0032] The bonding between the section or layer of thinned concrete (2) with the section or layer of plaster (1) is performed by means of what is denominated as bonding mortar in the sector. This bonding mortar seeks to bond both sections, where the following can be used as bonding mortar, epoxy resins, latex type acrylic copolymers, cement glues, etc. where the best results are obtained in the case of using acrylic copolymers.

[0033] On the other hand, the lightweight aggregate used in the manufacture of the thinned concrete section of the plate, can be various types ranging from arlite, perlite, vermiculite, pumice stone, etc. The use of perlite is preferential due to its major lightness, thermal and acoustic insulation features as well as fireproof properties.

[0034] Any other material with a similar volcanic type or nature can be used and poured in the concrete as a thinning material which provides the concrete with the desired lightness.

[0035] Perlite is the product of the expansion of a raw mineral; its structure is formed by air cells which convert it into an excellent thermal and acoustic insulation. It is very easy to use. It is mixed with cement, lime, gypsum, and/or any other bonding agent where its application is like traditional mortar, which achieves a termination with a fine finish. Used as a lightweight aggregate or as a substitute for traditional materials, it permits a significant reduction in the structures calculation thanks to its specific low weight, achieving savings of up to 30% in its construction costs.

[0036] For the ironwork construction, once the thinned formwork plates object of the invention have been placed,

the concrete is directly poured on the plates, where the raw porosities present in the thinned concrete of the plates is sufficient for the grip between both concretes. Optionally as mentioned above, a bonding mortar can be applied between both concretes as a means to improve the grip of the concretes.

[0037] Figure 2 shows a series of thinned formwork plates (3) object of the invention placed on top of a strainer piece (4), with the object to form a support for the ironwork construction and after the removal of the strainer piece (4), the lower ceiling space is directly formed.

[0038] The thinned formwork plate object of the invention has a usage for the forming of ceilings, which are formed by means of a series of plates (3) placed on a straining piece system (4) with the plaster section or layer (1) of the plates (3) placed directly underneath, where the frameworks required to reinforce the ironwork concrete are placed on the plates.

[0039] In the case that the thinned formwork plates object of the invention are used for the construction of walls as mentioned above and shown in figure 3, the section or layer of thinned concrete (2) of the plates is aligned in its edges with the edges of the section or layer of plaster (1). The formwork plates are placed in a vertical way forming one or two vertical sides, leaving a space between both vertical sides, in such a way that section or layers of thinned concrete of the plates of both sides remain facing each other, filling the interior space (5) with frameworks (6) if required and with poured concrete.

[0040] In this way, once the recoverable structure of the formwork used in the forming of the wall is removed, at least one of the wall's plasterwork has been done, where the plaster section or plate of the formwork plates object of the invention remain visible.

[0041] It has not been considered necessary to make this description more extensive in order for any expert in this matter to understand the scope of the invention and the advantages derived from it.

[0042] The materials, form, size, and placement of the elements shall be susceptible to variation always when they do not alter the essential nature of the invention.

[0043] The terms which this report has described must always be taken in their most extensive and not limitative sense.

Claims

1. The thinned formwork plate, formed by a section or plate of plaster (1) on which a section or layer of thinned concrete (2) is placed, bonded to the former, **characterized** because the upper side of the concrete plate does not have ribs or grooves instead the porosity of the poured concrete directly serves for its grip with the ironwork concrete and lacks all interior corrugated steel framework, where a bonding mortar is used in order to bond the section or layer of plaster (1) with the section or layer of concrete (2) and a

bonding mortar or additive with self-adherent bonding properties has been added to the thinned concrete (2) of the formwork plate thus seeking greater adherence among the composition elements of the concrete.

2. The thinned formwork plate according to claim 1, **characterized** because the bonding mortar used to be added to the concrete of the section or layer of thinned concrete (2) and used in the bond between the plaster and the concrete is an acrylic copolymer.
3. The thinned formwork plate according to claim 2, **characterized** because the added acrylic copolymer is a latex.
4. The thinned formwork plate according to claim 1, **characterized** because the bonding mortar used to be added to the concrete of the section or layer of thinned concrete (2) and used in the bond between the plaster and the concrete is an epoxy resin.
5. The thinned formwork plate according to claim 1, **characterized** because the bonding mortar used to be added to the concrete of the section or layer of thinned concrete (2) and used in the bond between the plaster and the concrete is a cement glue.
6. The thinned formwork plate according to claim 1, because the concrete of the thinned concrete plate (2) is thinned with materials of a volcanic origin.
7. The thinned formwork plate according to claim 5, because the material of a volcanic origin is perlite.
8. The thinned formwork plate according to claim 6, because the material of a volcanic origin is vermiculite.
9. The thinned formwork plate according to claim 7, because the material of a volcanic origin is pumice stone.
10. The thinned formwork plate according to any of the above claims, because the concrete of the thinned concrete of the formwork plate has been embedded in its interior with a plastic mesh network.
11. Use of the thinned formwork plate object claimed above for the forming of ceilings because the ceiling is formed by means of a series of plates (3) placed on a straining piece system (4) with the plaster section or layer (1) placed directly underneath, where the frameworks required to reinforce the ironwork concrete are placed on the plates.
12. Use of the thinned formwork plate object claimed above for the forming of walls, **characterized** because the thinned formwork plates are aligned in a

vertical way forming one or two vertical sides, leaving a space between both vertical sides, in such a way that section or layers of thinned concrete of the plates of both sides remain facing each other, filling the interior space with frameworks if required and with poured concrete, where at least one of the wall's plasterwork has been done, where the section or plaster plate of the thinned formwork plates used remain visible.

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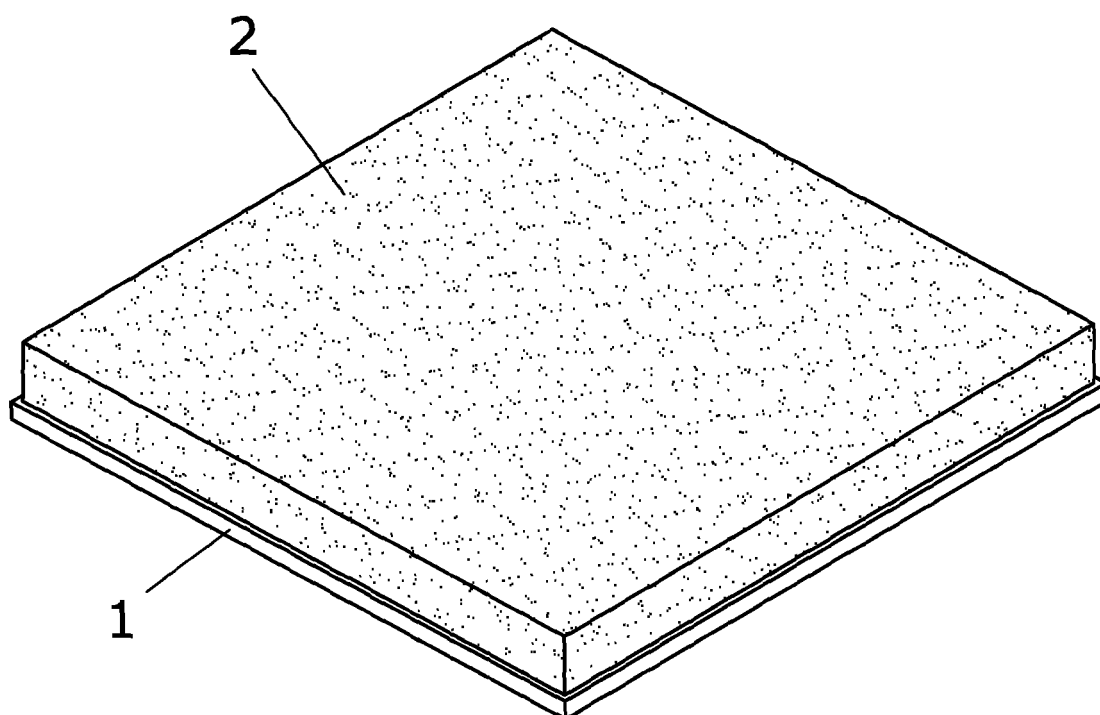


FIG.1

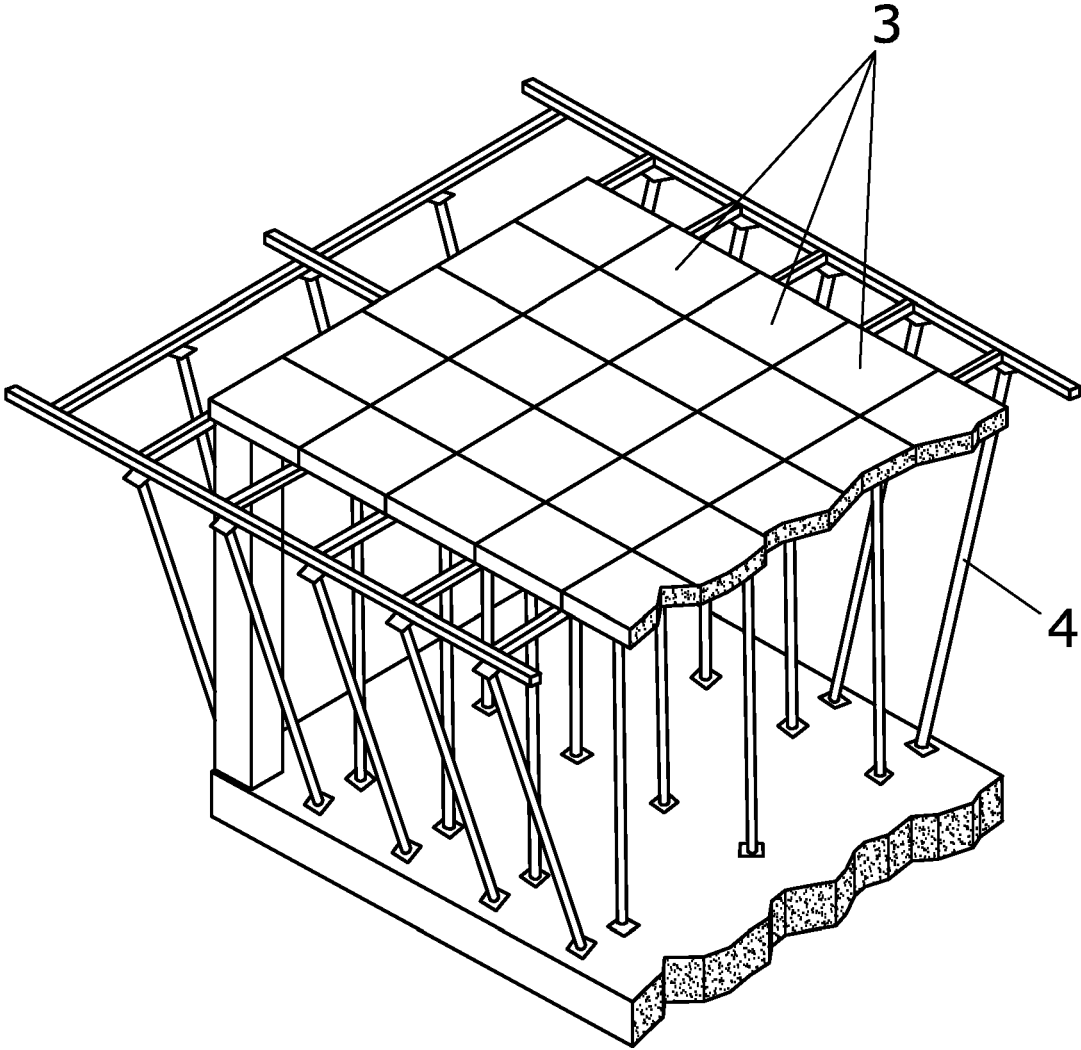


FIG.2

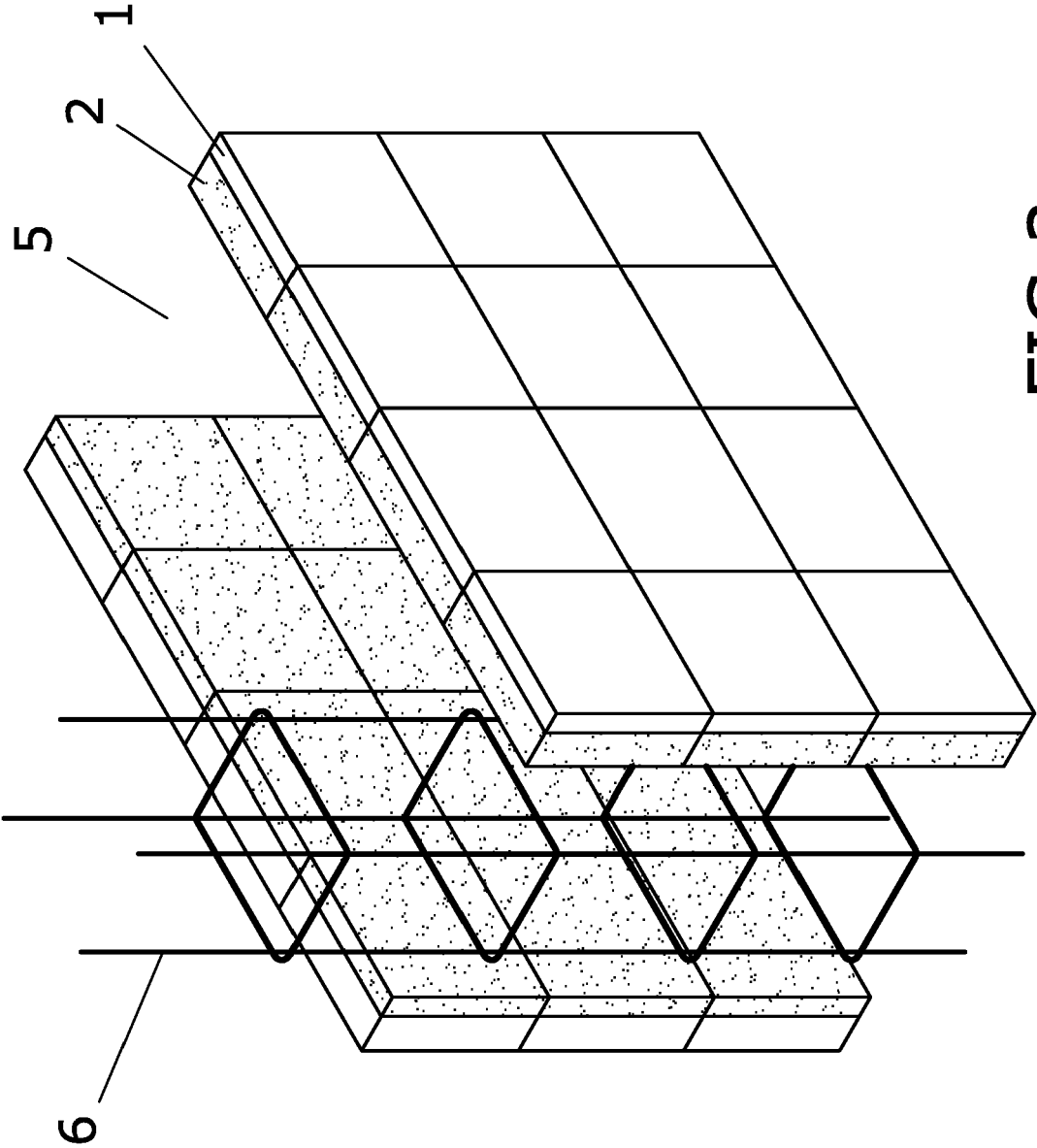


FIG. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 624 123 A (DEL CASTILLO CABELLO) 8 February 2006 (2006-02-08) * column 1, paragraph 8 - column 2, paragraph 28; figures *	1,10-12	INV. E04B5/36
A	EP 0 015 613 A (STAMICARBON BV) 17 September 1980 (1980-09-17) * page 2, line 1 - page 5, line 9 *	1-5, 10-12	
A	US 6 562 444 B1 (GLEESON ET AL.) 13 May 2003 (2003-05-13) * column 2, line 57 - column 5, line 15; figures *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04B E04C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 November 2006	Examiner Righetti, Roberto
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

4

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 38 1024

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-11-2006

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REFERENCES CITED IN THE DESCRIPTION

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- ES 200401869 [0008] [0012] [0015]