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(54) **Apparatus structure for manufacturing articles**

(57) The apparatus structure for manufacturing articles comprises a frame (1) defining two by two opposite

and parallel faces, at least one pair of said opposite and parallel faces (50, 60) of said frame being narrowable with narrowing means (100).

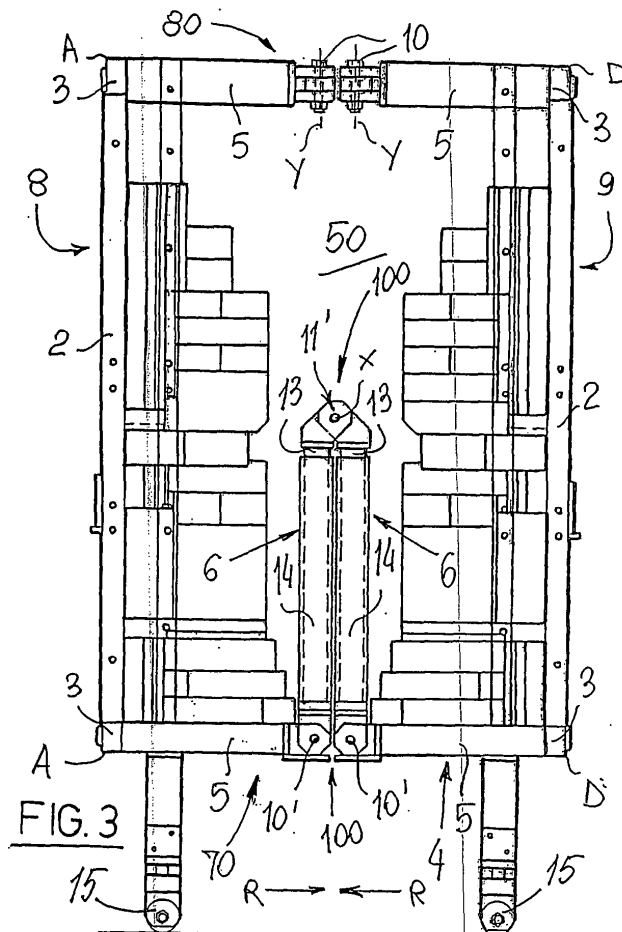


FIG. 3

Description

[0001] The invention relates to an apparatus structure for manufacturing articles, in particular ceramic articles, like tiles and slabs.

[0002] In the ceramic industry the articles are manufactured using systems that comprise a group of work stations.

[0003] These stations comprise an initial station where the mixes of raw materials are prepared suitable for manufacturing the unbaked articles which are then put inside presses, if the mixes are made with powder raw materials, or in extruders, if the mixes are made with raw materials at the plastic state, which form the articles after which they are first placed inside driers to eliminate any moisture left and then in baking kilns where they are baked to stabilise their structures and decorations.

[0004] Both the driers and the baking kilns comprise a structure composed of modules that are joined together according to necessity in a pre-established number of items.

[0005] The size of each module is such that it can fit inside a container or inside a body of a transport vehicle.

[0006] Each module is made with cross elements, up-rights and longitudinal members that are joined together to form a frame that defines two lateral faces, two transversal faces, one bottom face and one top face which are then closed by respective walls, preferably in a refractory material, heat resistant, so as to define a chamber, or a portion of a chamber, for drying or baking respectively, which has an opening for entry and an opposite opening for exiting so as to allow the introduction of the articles and their ejection towards the outside.

[0007] Inside the chamber defined by the joining of a plurality of modules, apparatuses are then mounted intended for drying or baking the articles, such as, for instance, bodies for raising the inside temperature in the shape of distributors of heat produced by suitable burners to reach the effect wanted of either drying or baking.

[0008] Downstream from these devices for raising the temperature, further devices are also mounted to rapidly cool the baked or dried articles.

[0009] The treated articles are then taken out of the kilns or driers and loaded on transport trolleys that have several tiers.

[0010] To reduce the times for starting the apparatuses for manufacturing articles, like tiles and slabs, the frames of the modules that are intended to form these driers or these kilns are mounted previously on the manufacturer's premises and are fitted with at least the side walls, floors and tops.

[0011] Then, when they are shipped to the user companies and lastly positioned along the manufacturing lines, the frames of the modules are joined to the other modules, their number being such to make the length wanted either of a drier or a kiln, and then they are completed by fitting all the devices mentioned previously.

[0012] This state of the art does have a series of drawbacks.

backs.

[0013] A first drawback is that the frames that form the structures of each module, whether kilns or driers, have to be transported from the manufacturers to the user companies in an already completed pre-assembled condition of the bearing structures and this requires transport means that are able to transport them in such pre-assembled conditions.

[0014] Another drawback is that these transport means like, e.g., ships when the frames have to be sent to user companies which are located in non-European continents, have shipping rates that vary according to the bulk of the objects being carried, or of the containers holding them: therefore, the pre-assembled frames are very bulky and, consequently, transport costs are proportionally high.

[0015] Another drawback is that these pre-assembled frames, due to their weight and dimensions, have to be moved with suitable movement means so they can be placed in the respective positions in which they are going to be used along the production lines.

[0016] In addition, when they are taken to companies where they have to be assembled with other modules, a lot of space is needed for both their temporary positioning, for manoeuvring and preparing them for the definitive assembly with the other modules.

[0017] Consequently, transporting and positioning the pre-assembled structures that form the frames is, in all, extremely complicated and, above all, expensive.

[0018] An object of the invention is to improve the state of the art.

[0019] A further object of the invention is to make an apparatus structure for manufacturing articles that has considerably smaller overall dimensions, at least while being transported from the manufacturers to the user companies, thus maintaining the same production capacity.

[0020] Another object of the invention is to make an apparatus structure for manufacturing articles which allows to complete quickly their assembly and positioning along the production lines and without requiring any specific movement means and in spaces considerably smaller with the respect to the known technique.

[0021] According to the invention, an apparatus structure is provided for manufacturing articles comprising a frame with either a parallelepiped or cubic shape defining two by two opposite and parallel faces, characterised in that it comprises narrowing means for narrowing at least one pair of said opposite and parallel faces along a narrowing direction. According to another aspect of the invention, a narrowing method is provided, suitable for narrowing the dimensions of apparatus structures for manufacturing articles, comprising frames defining two by two opposite and parallel faces which have pairs of opposite and parallel sides, characterised in that said narrowing comprises bringing opposite and parallel sides of one of said pairs of opposite and parallel sides close together along a narrowing direction.

[0022] The apparatus structure for manufacturing articles and the narrowing method therefore make it possible to reduce the overall dimensions of an apparatus according to necessity and at least along one narrowing direction so, e.g., to be easily transported at considerably lower costs, restoring it to its original dimensions once it reaches its destination of use and in such a way that also the subsequent assembly is easy even by assembly personnel only, without having to use specific movement devices.

[0023] Further characteristics and advantages will appear more evident from the detailed description of an apparatus structure for manufacturing articles, illustrated indicatively by way of non limiting example, in the attached drawings wherein:

Figure 1 is a schematic top view of a frame of a module to form a baking kiln, fitted with narrowing means and in a use configuration;

Figure 2 is a front view of the frame of Figure 1;

Figure 3 is a front view of the frame of Figure 1 in a reduced configuration;

Figure 4 is the corresponding top view of the frame of Figure 3;

Figure 5 is a very schematic view and in perspective of a frame of a module to form a baking kiln, fitted with narrowing means along a transversal direction;

Figure 6 is a very schematic view and in perspective of the frame of Figure 5 in a first reduced version along a transversal direction;

Figure 7 is a very schematic view and in perspective of the frame of Figure 5 in a second reduced version along a transversal direction;

Figure 8 is a very schematic view and in perspective of a frame fitted with narrowing means along a vertical direction;

Figure 9 is a very schematic view and in perspective of the frame of Figure 8 in a reduced configuration according to a vertical direction.

[0024] With reference to Figures 1 and 2, a frame has been globally indicated by 1 of a module suitable for making up, joined with other modules, a baking kiln suitable for baking articles, in this specific case ceramic articles such as tiles, slabs and the like.

[0025] As can be seen in Figures 1 and 2, the frame comprises a plurality of uprights 2, longitudinal members 3 and cross elements 4 that define six faces, two by two parallel and perpendicular to each other.

[0026] The frame 1 illustrated in Figures 1 and 2 has the cross elements 4 that are fitted with narrowing means 100 and which comprise, for each of these, with reference to Figures 3 and 4, two fixed segments 5 that are fixed at their tops "A", "B", "C", "D" where they are joined to the corresponding longitudinal members 3 and uprights 2 and two respective movable segments 6 that extend from the fixed segments 5 and which converge one towards the other.

[0027] The movable segments 6 have respective first ends 106, which are hinged by means of hinges 10 at concurrent ends of the fixed segments 5, and second ends 206, which are hinged together by means of a common hinge 11 placed on a symmetrical plane indicated with "PS".

[0028] In one embodiment illustrated in Figures 1 and 2, it can also be seen that the hinges 10 and 11, which connect the fixed segments 5 and the movable segments 6 of the top cross elements 4 together, have rotation axes "Y" lying on a vertical plane while the hinges that connect the fixed segments 5 and the movable segments 6 of the bottom cross elements 4 together, indicated with 10' and 11' to distinguish them from the previous ones, have substantially horizontal rotation axes "X".

[0029] This construction choice, for which the rotation axes "Y" of the hinges 10 and 11 are perpendicular to the rotation axes "X" of the hinges 10' and 11', is purely an example and does not exclude the possibility that the positions of the rotation axes "X" and "Y" can be changed over or, yet again, that the rotation axes "X" and "Y" are all arranged parallel with one another, as can be seen, for example, in Figures from 5 to 9.

[0030] In turn, the movable segments 6 are made up of at least two telescopic elements 13 and 14, with the element 13 sliding inside the element 14.

[0031] The elements 13, one sliding inside the respective elements 14, make it possible to modify the length of the movable segments 6 so that the faces defined between the uprights 2 and the cross elements 4, indicated with 50 and 60 respectively, can be narrowed not only by the rotation of the movable segments 6 in relation to the fixed segments 5 around the hinges 10 and 11, and 10' and 11', but also by the sliding of the telescopic elements 13 inside the elements 14, as can be seen in Figures 3 and 4.

[0032] Between the elements 13 and the elements 14 locking means 7 are provided which are suitable for locking the elements 13 from sliding when the frame 1 is restored again to its maximum original dimensions; these locking means are made according to the forms known like, e.g., respective pins that can be inserted transversally in a series of through holes obtained in the elements 13 and 14.

[0033] The working of the frame 1 is the following: it is produced by assembling together in the known way, the uprights 2, the longitudinal members 3 and the cross elements 4 and, eventually, by mounting also part of the walls that form the kiln baking chamber.

[0034] The frame 1 has normally a parallelepiped shape and therefore defines six faces that are two by two parallel to each other and which are perpendicular to the other faces.

[0035] Practically, the frame 1 has two parallel and vertical side edges, indicated with 8 and 9, two transversal and vertical faces 50 and 60, a floor 70 and a top 80, both horizontal.

[0036] When it is necessary to reduce the dimensions,

e.g., of the transversal faces 50 and 60, the elements 13 are made to slide inside the corresponding elements 14, after having released the locking means 7.

[0037] Subsequently, the movable segments 6 are made to rotate with respect to the fixed segments 5 around the hinges 10, 11 and 10' and 11' and turning them towards the inside of the frame 1, as indicated by the arrows "F" in Figure 5, so that the movable segments 6 are arranged parallel and side by side with each other and all lying near the common symmetrical plane "PS".

[0038] In this way, the dimensions of the transversal faces 50 and 60 are narrowed considerably, along converging narrowing directions indicated by the arrows "R".

[0039] To facilitate sliding of the side edges 8 and 9 parallel to themselves and along the narrowing directions "R", the uprights 2 can have wheels 15 at the respective bottom ends, as can be seen in Figure 3, normally of the pivoting type and lockable in one rotation direction.

[0040] In this configuration with reduced dimensions, the frame 1 can be transported at considerably lower shipping costs.

[0041] Once the frame 1 reaches its destination, operating in the reverse order to what is described above, the original dimensions of the frame 1 are restored.

[0042] The sliding of the side edges 8 and 9 parallel to themselves and in a direction opposite to the narrowing direction is made possible by the pivoting wheels 15 which, besides this, also make it possible to bring several frames 1 close to each other to be joined to form a kiln or a drier.

[0043] When the frame 1 has been restored to its maximum dimensions, the locking means 7 are reactivated so the frame 1 remains fixed in this final use configuration.

[0044] For additional safety, it is also possible to definitively lock the elements 13 and 14 and the hinges 10, 11, 10' 11', e.g., by means of welding.

[0045] It should be noted that, thanks to the wheels 15, the restoration of the original dimensions of the frame 1 can also be completed manually by the operators without any need for lifting or supporting means.

[0046] In fact, the frame 1 is self-bearing and the wheels 15, notably reducing the friction with the ground, facilitate the moving away of the side edges 8 and 9 and, consequently, the extraction of the elements 13 from the elements 14.

Claims

1. Apparatus structure for manufacturing articles, comprising a frame (1) which defines two by two opposite and parallel faces, **characterised in that** it comprises narrowing means (100) for narrowing at least one pair of said opposite and parallel faces (50, 60) along a narrowing direction (R).
2. Structure according to claim 1, wherein said apparatus comprises a drier.

3. Structure according to claim 1, wherein said apparatus comprises a baking kiln.
4. Structure according to claim 1, wherein said frame (1) is modular and joinable with other identical or similar frames (1) to form said apparatus for manufacturing articles.
5. Structure according to claim 1, wherein each face of said pair of faces is defined by parallel upright means (2) and by parallel cross elements means (4) joining said upright means (2).
6. Structure according to claim 1 or 5, wherein said cross elements means (4) can be folded in planes (PS) perpendicular to said pair of faces (50, 60).
7. Structure according to claim 1 or 5, wherein said cross elements means (4) can be folded in planes parallel to said pair of faces (50, 60).
8. Structure according to claim 6, wherein said planes comprise a symmetrical median plane (PS).
9. Structure according to any of the claims 1, 5, 6, wherein said narrowing means (100) comprise: movable segments (6) of said cross elements means (4) defining respective first diverging ends (106) turned towards fixed segments (5) of said cross elements means (4) fastened to said upright means (2) and opposite second ends (206) converging between them; first hinging means (10, 10') placed in between said first ends (106) and said fixed segments (5) and second hinging means (11, 11') placed in between said second converging ends (206) of said movable segments (6).
10. Structure according to claim 9, wherein said first hinging means (10, 10') and second hinging means (11, 11') have rotation axes (X, Y) parallel to each other and parallel to said pair of faces (50, 60).
11. Structure according to claim 9, wherein said movable segments (6) comprise telescopically sliding elements (13, 14), so as to reduce the lengths of said movable segments (6).

12. Structure according to claim 1 or 5, wherein said upright means (2) are foldable in planes perpendicular to said pair of faces (50, 60).
13. Structure according to claim 1 or 5, wherein said upright means (2) are foldable in planes parallel to said pair of faces (50, 60).
14. Structure according to any of the claims 1, 5, 12, 13, wherein said narrowing means (100) comprise: movable segments (6) of said upright means (2) defining

respective first diverging ends (106) turned towards fixed segments (5) of said upright means (2) fastened to said cross elements means (4) and opposite second ends (206) converging between them; first hinging means (10, 10') placed in between said first ends (106) and said fixed segments (5) and second hinging means (11, 11') placed in between said second converging ends (206) of said movable segments (6).

15. Structure according to claim 14 wherein said first hinging means (10, 10') and second hinging means (11, 11') have rotation axes (X, Y) parallel to each other and parallel to said pair of faces (50, 60).

16. Structure according to claim 14, wherein said movable segments (6) comprise telescopically sliding elements (13, 14), so as to reduce the lengths of said movable segments (6).

17. Structure according to claim 5 wherein said upright means (2) have respective bases fitted with wheel means (15) for sliding onto resting surfaces.

18. Structure according to claim 17 wherein said wheel means comprise wheels (15) pivoting according to rotation axes parallel to said upright means (2).

19. Narrowing method, suitable for narrowing the dimensions of apparatus structures for manufacturing articles, comprising frames (1) defining faces (50, 60) two by two opposite and parallel to each other which have pairs of opposite and parallel sides (2, 3, 4), **characterised in that** said narrowing comprises bringing opposite and parallel sides of one of said pairs of opposite and parallel sides close together along a narrowing direction (R).

20. Method according to claim 19 wherein said bringing close comprises rotating portions (6) of at least one pair of said opposite and parallel faces (50, 60) on respective rotation planes so as to position said portions (6) rotated parallel to each other and transversal with respect to said at least one pair of faces (50, 60).

21. Method according to claim 20, wherein each of said portions (6) comprises one half of said faces of said pair of faces (50, 60).

22. Method according to claim 20, wherein said rotating comprises rotating according to converging directions.

23. Method according to any of the claims from 20 to 22, wherein said rotating comprises rotating substantially central portions of said faces of said pair of faces.

24. Method according to claim 20, wherein said rotating comprises rotating according to perpendicular directions (F).

25. Method according to claim 20, wherein said narrowing comprises bringing further two faces of a further pair of opposite and parallel faces close together and arranged in said frames (1) in planes perpendicular to said pair of faces (50, 60).

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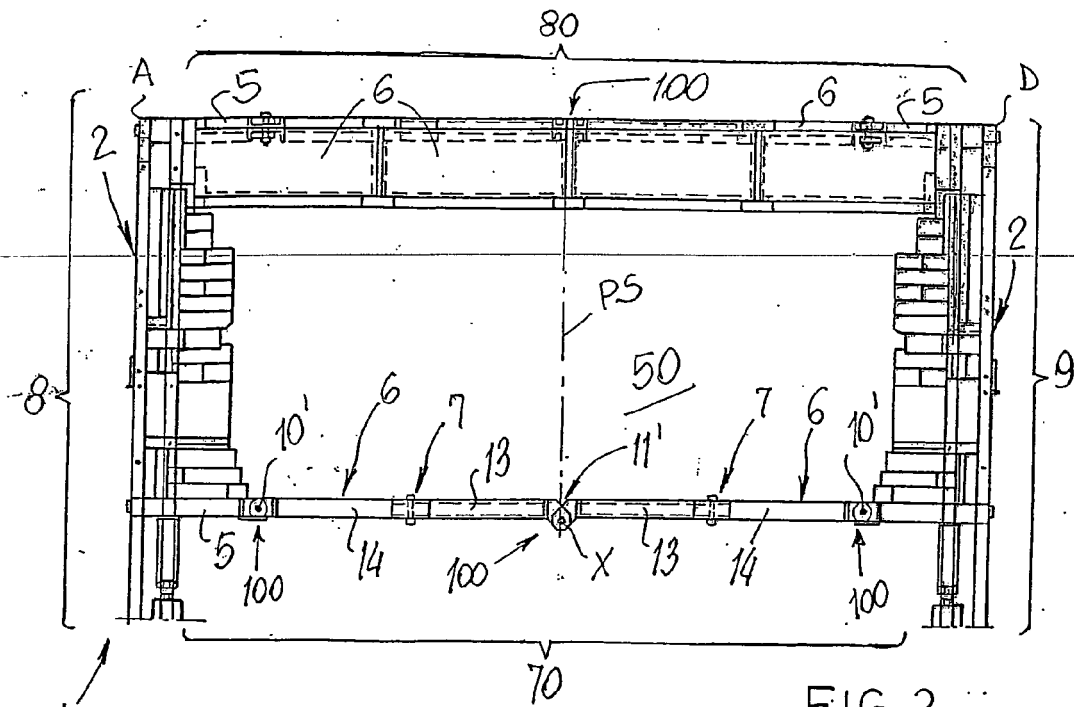


FIG. 2

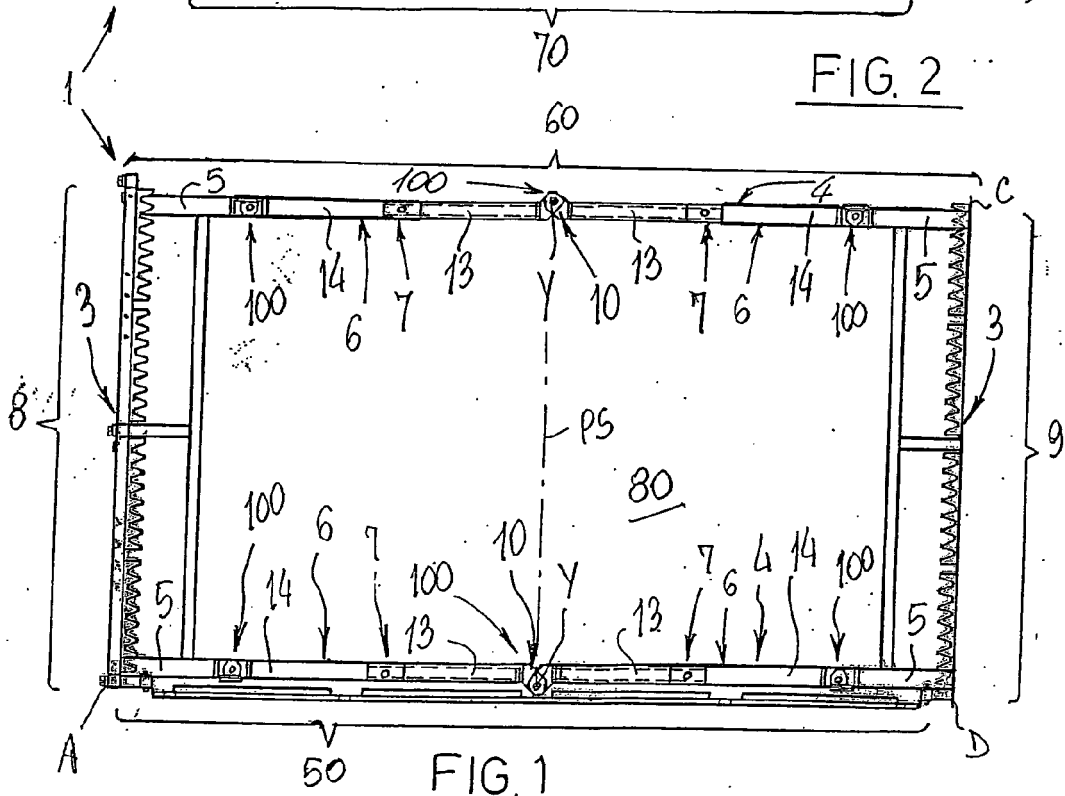
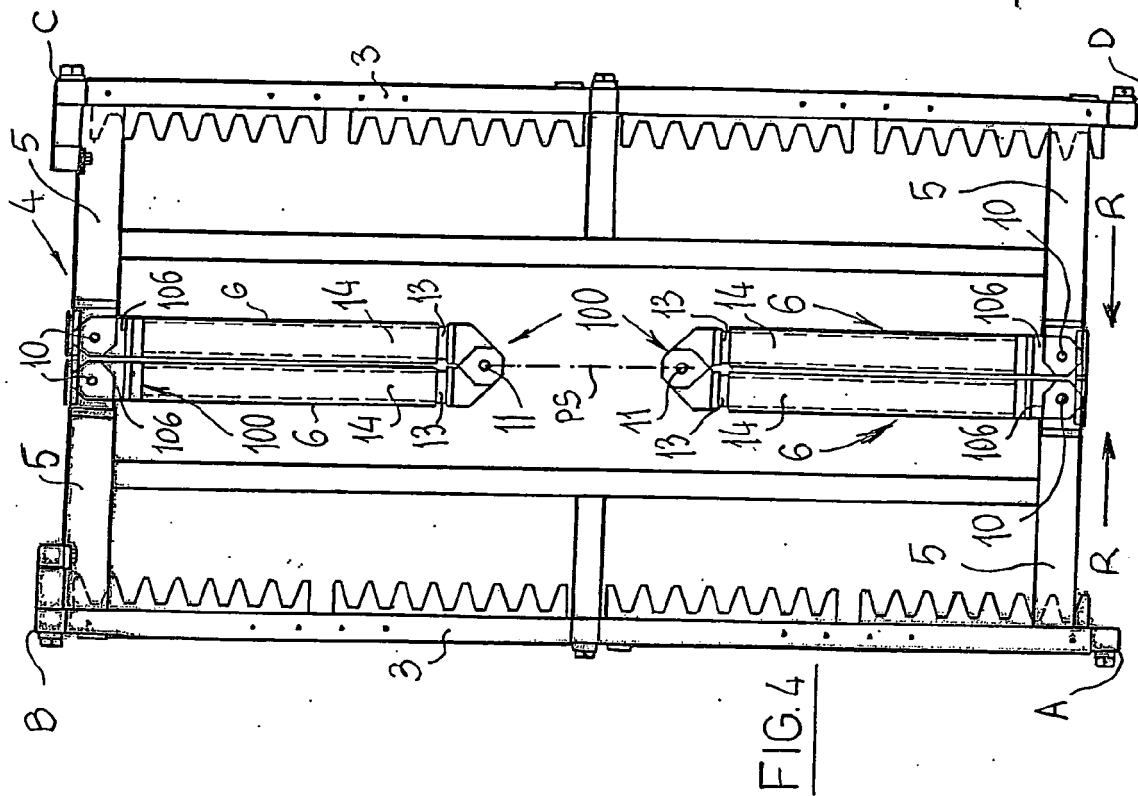
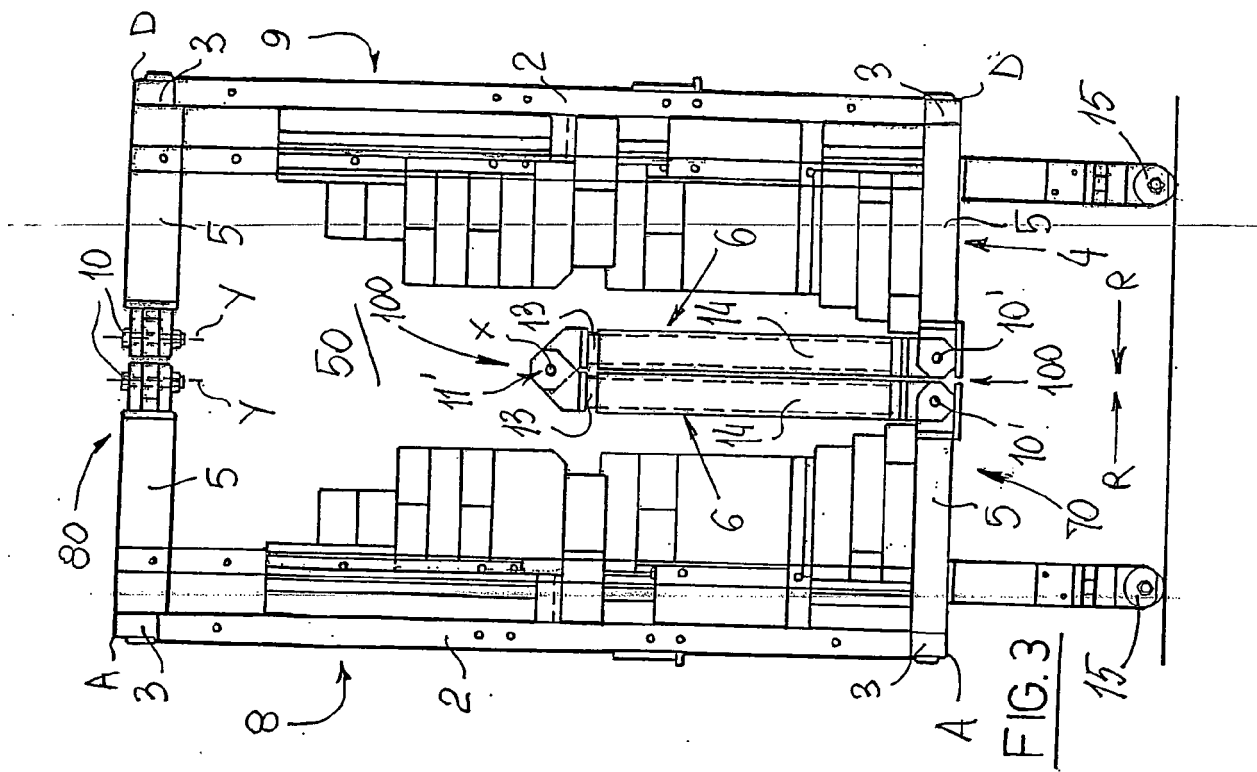
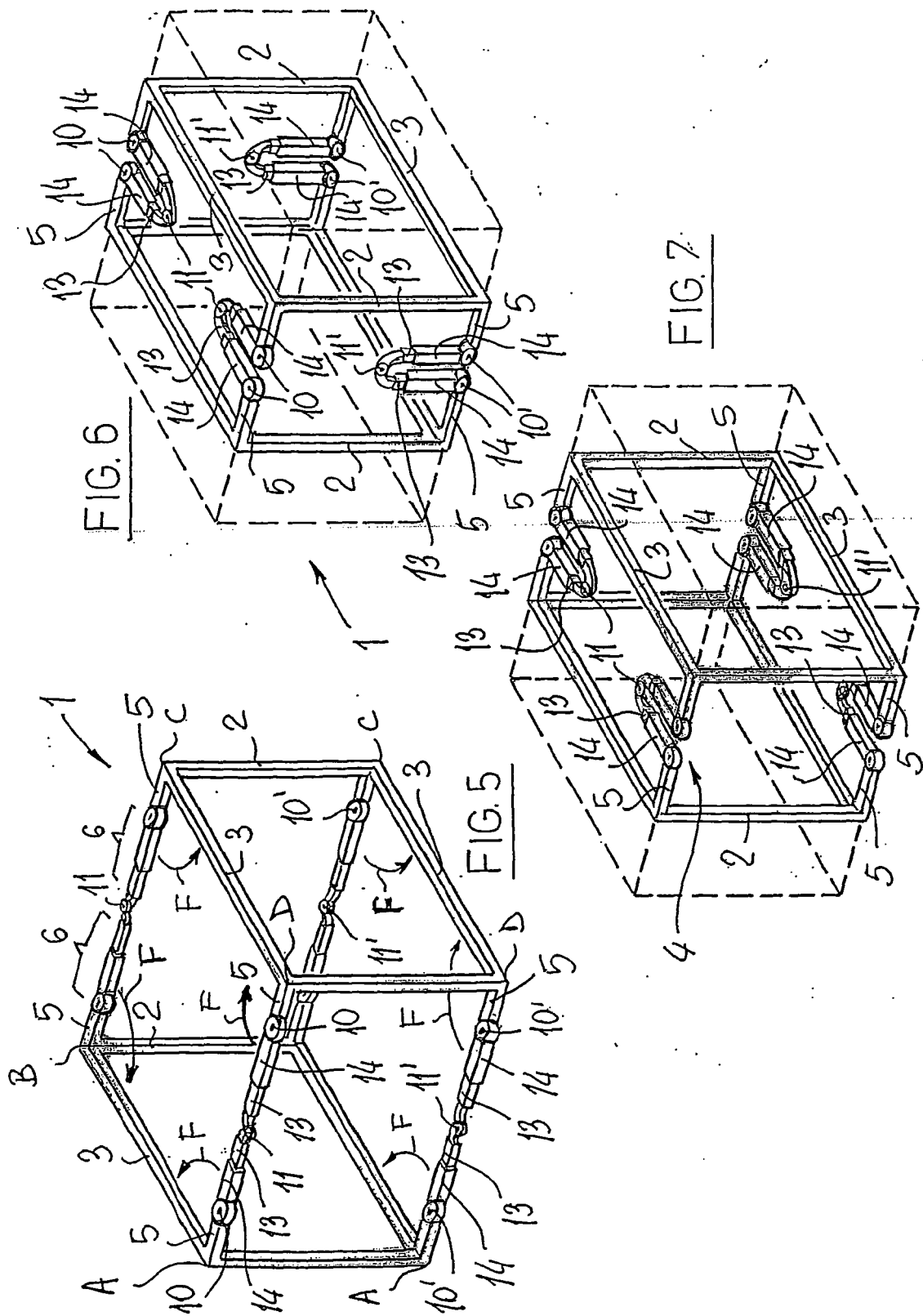
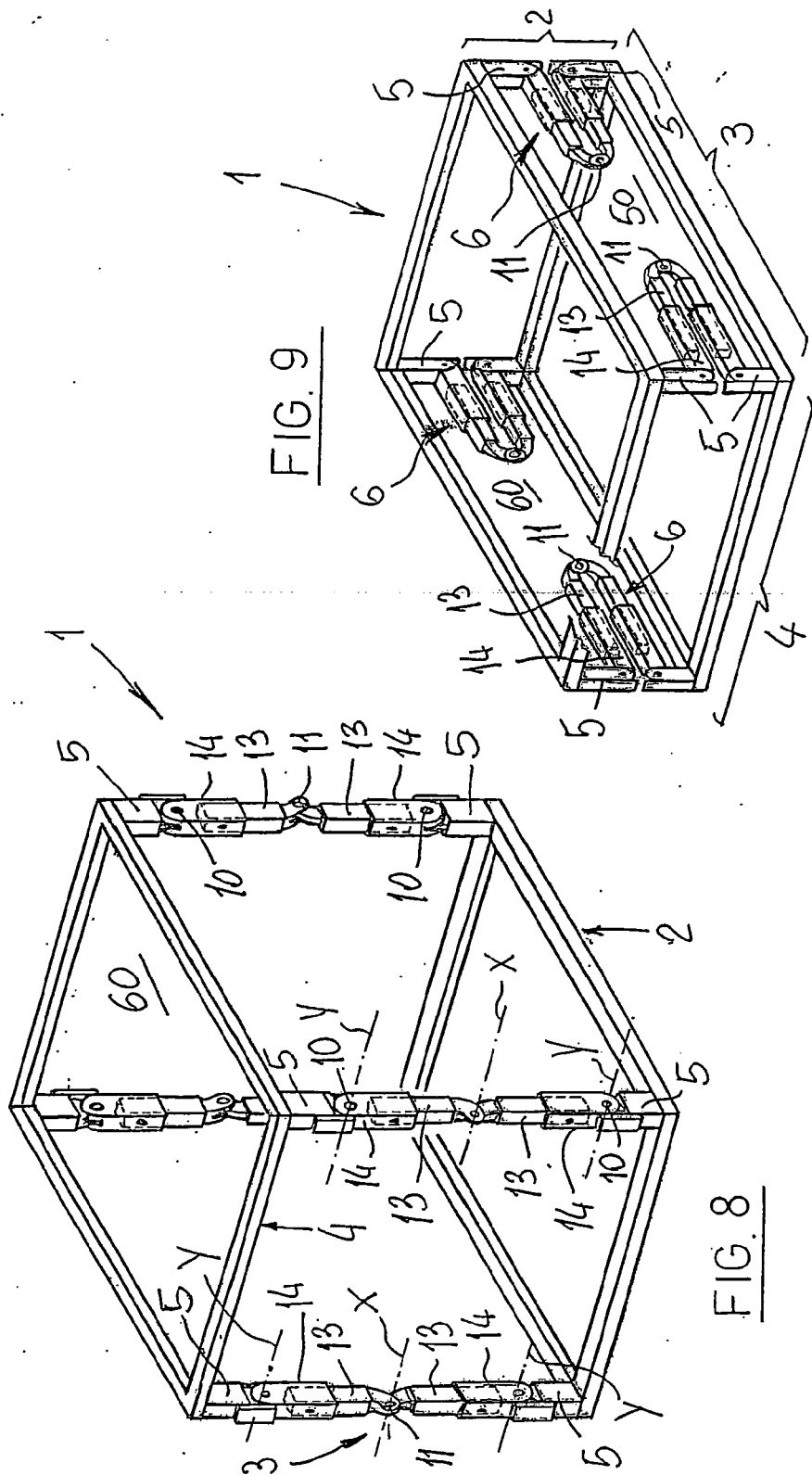


FIG. 1









European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 00 6336

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B65D
Place of search		Date of completion of the search	Examiner
Munich		3 May 2007	Lombois, Thierry
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 00 6336

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