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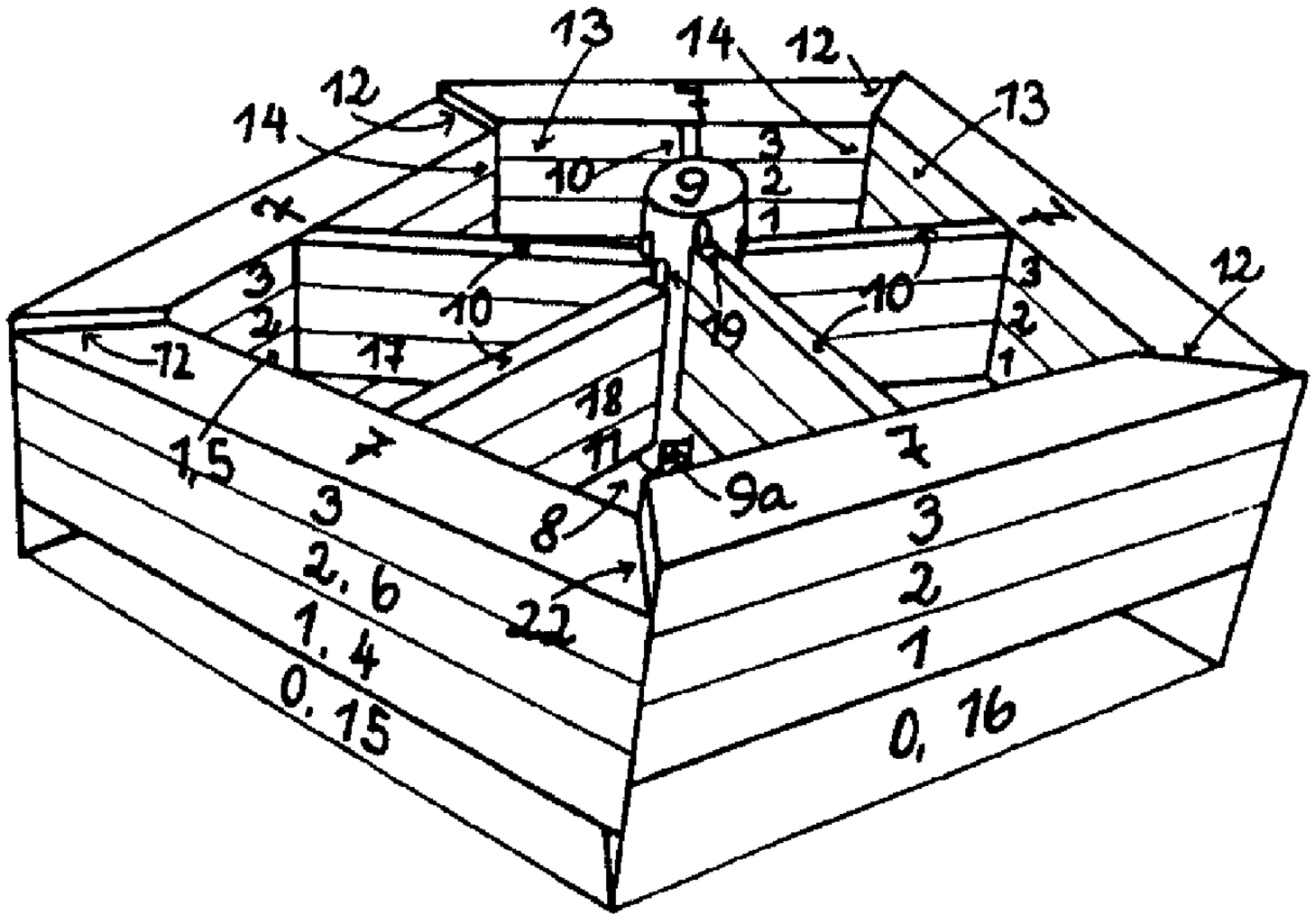
(54) **CONSTRUCTION CIRCULAIRE EN SPIRALE NE COMPORTANT QU'UNE CAGE D'ESCALIER CENTRALE HELICOIDALE**

(54) **SPIRAL RING-TYPE CONSTRUCTION WITH A SINGLE SPIRAL CENTRAL STAIRWELL**



(57) Des bâtiments à plusieurs étages, présentant au moins trois côtés, entourent, de façon circulaire, un cour intérieure (8). Les étages (1, 2, 3) ne se trouvent pas dans un plan, mais l'étage Y (1, 5) d'un secteur de ce bâtiment à plusieurs côtés est, par rapport à l'étage X (1, 4) du secteur placé devant, décalé vers le haut de sorte qu'après un tour complet en spirale, l'étage X (2, 6) du nouveau "cercle d'étage" (2) est positionné au-dessous de l'étage X (1, 4) du "cercle d'étage" placé devant. Cette disposition des étages en spirale implique que la hauteur de pièce du rez-de-chaussée augmente dans les divers secteurs (0), d'un secteur à l'autre, chaque fois d'un

(57) The invention relates to a multi-story, at least triangular building surrounding an inner court (8) in a ring shape. Instead of the stories (1, 2, 3) lying in one plane, story Y (1, 5) of one sector of this multiangular building opposite story X is elevated (1, 4) in relation to the previous sector to the extent that after one complete spiral turn, story X (2, 6) of the next "round of stories" (2) is positioned above story X (1, 4) of the previous round of stories. A prerequisite for this spiral story arrangement is that the ground floor room height in the individual sectors (0) increases from sector to sector by an xth of the upper story height each time. The different

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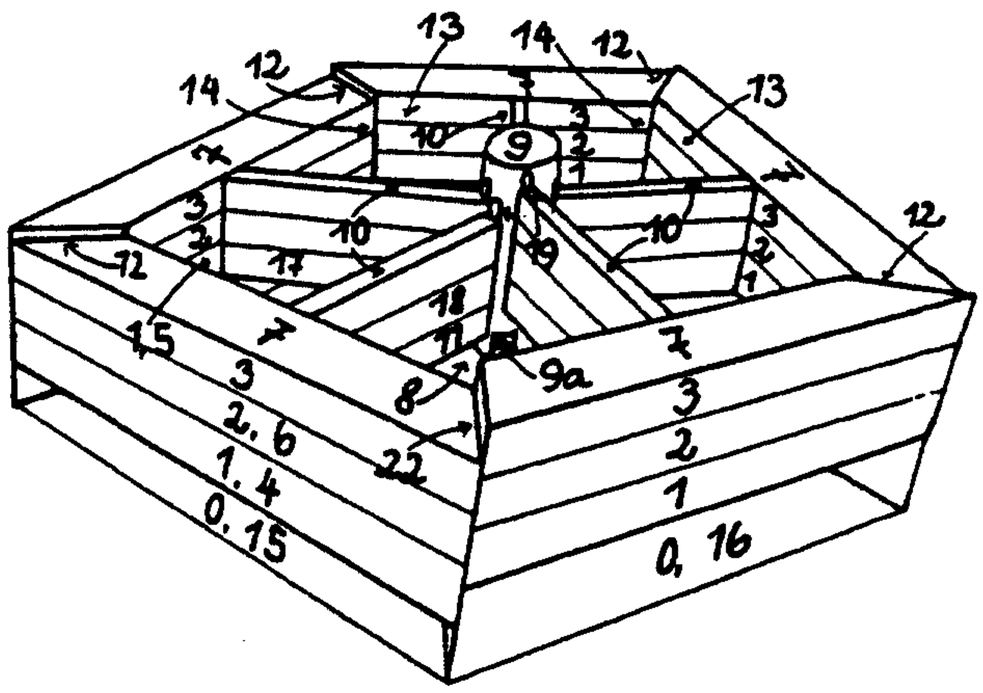
xième de la hauteur de l'étage supérieur. Les différentes hauteurs de pièce des secteurs du rez-de-chaussée (0) offrent des possibilités d'utilisation différenciées adaptées aux exigences respectives. Au centre de la cour intérieure (8), se trouve la cage d'escalier (9) cylindrique, comportant un escalier tournant (9a) et, éventuellement, des ascenseurs et d'autres installations, ladite cage d'escalier partant du sous-sol ou du garage souterrain. Au niveau de l'étage le plus bas du premier cercle d'étage (1, 4), la première voie de liaison ou transition (11) conduit de la cage d'escalier (9) à l'étage (1, 4) opposé à ce bâtiment central, et tous les étages sont, à la suite, reliés radialement à la cage d'escalier centrale.

room heights of the ground floor sectors (0) present different possibilities for use, according to requirements. The cylindrical central stairwell (9) which starts in the basement story or the underground car park, is located in the center of the inner court with a spiral staircase (9a) and if required, an elevator facility and other installations. The first link unit or transition (11) leads from the stairwell (9) to the story facing this central building at the level of the lowest story of the first round of stories (1,4,), all the stories being then connected radially with the central stairwell, in succession.

CA 02283733 1999-09-13

(57) Abstract

The invention relates to a multi–story, at least triangular building surrounding an inner court (8) in a ring shape. Instead of the stories (1, 2, 3) lying in one plane, story Y (1, 5) of one sector of this multiangular building opposite story X is elevated (1, 4) in relation to the previous sector to the extent that after one complete spiral turn, story X (2, 6) of the next "round of stories" (2) is positioned above story X (1, 4) of the previous round of stories. A prerequisite for this spiral story arrangement is that the ground floor room height in the individual sectors (0) increases from sector to sector by an xth of the upper story height each time. The different room heights of the ground floor sectors (0) present different possibilities for use, according to requirements. The cylindrical central stairwell (9) which starts in the basement story or the underground car park, is located in the center of the inner court with a spiral staircase (9a) and if required, an elevator facility and other installations. The first link unit or transition (11) leads from the stairwell (9) to the story facing this central building at the level of the lowest story of the first round of stories (1,4,), all the stories being then connected radially with the central stairwell, in succession.



„Spiral ring-type construction with a single spiral central stairwell"

Technical background of the invention:
Subject-matter of the invention is the circular construction of a polygonal building with the ring-shaped building being set up in trapezoid sectors and the storeys being superimposed as in a spiral.

State of engineering employed up to now:
In architecture there are various forms of polygonal buildings which completely encircle an inner courtyard and where a construction in the center of the courtyard may also serve as a staircase with connecting passages to the buildings around it.
However, investigation carried out by the inventor has not furnished evidence that in architecture there are polygonal buildings in which the individual sectors or storeys are laid out in such a way that the initial structure need not be altered with a change of its size and where, moreover, all these sectors or storeys may at any level be reached from a central staircase which is preferably positioned in the middle of the building complex.

Also the invention registered under patent number DE-A- 2065437 "Housing Estate with Several Adjacent Individual Buildings Consisting of Pre-manufactured Units" corresponds only partly to the solution provided by the inventor and the characteristics of the claimed invention are not anticipated by the already known technique. Task and subject matter of the inquired invention "Housing Estate" is not the set up of a building complex which – such as the claimed invention - can be utilized for different purposes, but it is conceived as a residential building in the true sense of the word. Moreover, as the individual buildings of the "Housing Estate" are set up in horizontal and rectangular angles, a structure-saving expansion in all directions can be realized to a very limited extent only - as opposed to the invention's trapezoid construction method which renders such an expansion possible. And finally is the inquired "Housing Estate" not based on a spiral construction method as a matter of principle, but is open on one side so that it is not possible, for instance, to set up spiral corridors in the main building analogous to the winding staircase in the middle.

Likewise does the invention registered under patent number EP-A-118723 "Technique for Setting Up Large-Scale Subterranean Parking Lots" not anticipate the technical characteristics of the claimed invention. The main characteristic of these large-scale parking lots is a cylindric outer wall and an endless, i.e. continuous spiral surface which is not interrupted between the individual sectors and which thus fundamentally differs in structure as well as purpose from the "Spiral Construction Method" applied for patient.

Both the patents DE-A-2065437 as well as EP-A-118723 thus are not a technical equivalent to the claimed invention.

Technical task to be solved by the invention:
Even though there is the thoroughly right and justified saying that "Nature is the best architect", it must be doubted that architecture actually takes or ever took an example by nature.
In flora, it does make sense, of course, that trees do not grow as geometrical quadrangles. In architecture, building constructions are mainly erected in quadrangular forms, which - especially in bigger objects - causes problems not known in nature. For instance, a big block of flats with a longitudinal orientation towards south has the big disadvantage that those living in the tract facing north never get any sun. This problem, for instance, can be solved in the best possible way by a pentagonally-shaped building.

As opposed to traditional forms of buildings, which allow an only limited scope for natural dynamics and thus always have to be "planned from top to bottom anew each time", the claimed invention is conceived as a construction method, the functional principle of which is based on geometric trapezoid and spiral forms. The invented construction method, which could be designated as "Spiral Construction Style" utterly differs from conventional architecture: *Only a building structure composed of trapezoid sectors with vertically staggering storeys automatically results in a spiral-shaped set-up of storeys.*
A ring, divided in trapezoid sectors, may change its circumference or expansion to any desired size, while the basic structure of the segments (sectors) always stays the same (fig. 2). If - as another dynamic element - a spiral is added to this two-dimensional flexible construction, the result is a three-dimensional structure which maintains its original set-up in any size and any part of the building-ring.
This principle already works with only a triangular shape and can then be employed for every kind of polygons. The spiral-shaped cycle of storeys results from the fact that the ground-floor sectors on which the upper-floor sectors are set up, vary in altitude, i.e. continuously increase in height from one sector to the other.
In analogy to a tree (one trunk with boughs growing from the trunk in a spiral and thereby forming the tree's top), the "Spiral Construction Method" also provides the advantage of one central staircase with connecting passages to the sectors of the peripherous building-ring.

In comparison to the conventional compact construction method, the inventor's "Spiral Construction Method" offers further positive effects, which will be described in the section "Advantages".

Advantages of the invention:

⇒ The construction method in which a polygonal building forms a closed ring and consists of preferably identical trapezoid sectors (7), offers maximum flexibility as far as employment of usable space is concerned: Without having to change the basic structure or the layout of rooms, any desired total area can be chosen by expanding or constricting the inscribed circle or the building's circumference (fig. 2).

⇒ With the "Spiral Construction Method", the available surface area can be utilized to a very large extent for building, since green plots and recreational facilities can be located in the inner courtyard and the parking lots under the inner courtyard or in subterranean parking lots.

⇒ As opposed to outer surfaces of ordinary buildings, which are often subject to negative influences and restrictions such as traffic noise, danger for playing children, little protection from wind or weather, etc., this building's construction-related inner courtyard (8) with its partial roofs between the spoke-like connecting passages (10) gives the residents much more possibilities to style and organize the inner courtyard individually and according to their requirements.

⇒ The staircase in the center of the building (9) as well as the inner courtyard (8) with all the possibilities it offers for individual creation, promotes and improves communication between the residents.

⇒ If the building is constructed, for instance, in the form of a pentagon, it is easier to achieve a more efficient orientation towards a certain direction, which is particularly desirable in residential buildings (in a pentagon, as figure 2 shows, the largest side points southwards while the smallest side points northwards)

⇒ Because of the circular construction, all apartments or commercial objects are also oriented towards the inner courtyard. This construction thus guarantees optimal conditions of light, i.e. an apartment located in the north-east sector, at the same time faces towards south-west in the direction of the inner courtyard. (fig. 2)

⇒ As the individual sectors of the polygonal building have a trapezoid form (7) in which the narrow side faces the inner courtyard while the broad side is directed outwards, the building opens from the inside towards the outside in an unlike proportion, which means that it allows a maximum incidence of light towards the inside while broadening the view when looking towards the outside.

⇒ The closed ring, characteristic of the "Spiral Construction Method", naturally provides the energetically important advantage that – as opposed to other forms of construction (e.g. ribbon construction or construction of detached houses) two outer walls can be avoided.

⇒ Depending on the dimension of the whole project, the connecting passages (10) which lead in a spoke-like form from the central staircase (9) to the individual sectors (7) may also be utilized for further functions (e.g. commercial utilization).

⇒ Because of the helical arrangement of storeys, there is - particularly in bigger projects with many apartments and/or other objects - the possibility to provide the parts facing the inner courtyard with continuous roofed arcades (13). By using this spiral-shaped path, which due to the different altitude is supplied with several steps on the individual sector's intersection (14), one may go from the basement along all the various floors up to the roof-top terrace.

⇒ The required altitudinal graduation in the sectors of the ground floor (0) provides several possibilities for utilization of the ground-level rooms. For instance, in a hexagonal object with a minimum height of 3 m in the upper storeys and a room-height of also 3 m in the lowest ground floor sector (0, 15), the spiral-shaped construction results in a room height of 5.5 m (0, 16) in sector 6 (highest sector of the ground floor). As there should always be leisure time- and shopping facilities in big residential premises, a ground floor with optimal and varied conditions of space fulfills all the required qualifications.

⇒ Because of the spiral-shaped construction method, the roof-top terrace's altitude differs from one sector to the other (12). With regard to irrigation or drainage, this graduation provides excellent conditions for laying-out extensive or intensive roof-top gardens.

⇒ As opposed to conventional, compact construction methods, the spiral-shaped ring-building is extremely earth-quake proof. The trapezoid building sectors (7) support each other and are moreover reinforced and held together with the central staircase (9) by the spoke-like connecting passages. Even in very big spiral building complexes with at least some of these supporting connecting spokes, stability in earthquakes is hardly impaired. This construction-related earth-quake proof building saves expensive precaution measures which other building constructions usually require additionally in order to provide adequate safety in seismic areas.

⇒ The structure of such a ring-form polygonal building with its sectors can immediately and very easily be visualized. Thus, even in a building complex of big dimensions, the clear and homogenous structure and the central staircase make it very easy to orientate oneself.

⇒ Only the "Spiral Construction Method" allows its user to cross the whole complex by just walking "straight ahead" without having to use a staircase and to finally arrive at the starting point which, of course, is in a different storey now. With the elevators and staircases that can be reached from the individual sectors, one may eventually return to the storey where one started off. It is particularly this efficient and easy tour through the trapezoid sectors (7) that make a spiral building very advantageous and suited for the utilzation in the field of culture, economy or formation and education.

⇒ Altogether, this "Spiralic Construction Method" provides a solution to the architectural cul-de-sac of conventional compact construction forms such as block of flats, ribbon construction or detached houses.

Specification concerning construction and realization of the invention:

By making use of the possibilities of this invention, it is intended to architecturally establish polygonal buildings, which can on the one hand be realized on a homogenous and simple pattern – and still permit a maximum of architectural variety – and on the other hand considerably improve the economic and ecologic conditions due to its structural advantages.

If, as for instance in residential objects, a maximum of light and sun is desired, the best possible form of building is a pentagon. For an entirely different utilization, the most favorable architecture might, depending on requirements, be an octagon.

It should furthermore be ensured that – irrelevant of the size and type of the building – the individuum, humans using these objects, immediately visualize the whole complex and thus may already orientate themselves mentally.

An essential ecologic aspect is that the building integrates nature and that natural ressources are being saved. The invention-related solution thus facilitates the set-up of roof-top gardens, thereby replacing those areas that were used for construction.

In order to meet all these demands, the following conditions have to be fulfilled:
The building is at any rate set up in the form of a polygonal ring, which means that there automatically is an inner courtyard (8). Corresponding to the number of its angles, the building ring consists of trapezoid sectors (7). The ground-floor sectors (0) vary in height, i.e. they are continuously increasing in height from the first to the last sector of the ground floor.

These facts create the following effect:
The upper storeys (1, 2, 3) which are set up on the ever increasing trapezoid ground-floor storeys automatically continue upwards in a spiral course. Depending on the type of the polygon, i.e. the number of trapezoid sectors resulting thereof, the difference in height from one ground-floor sector to the other can be determined. For instance, in a hexagonal object with an intended height of 3 m in the upper storeys and a room-height of also 3 m in the lowest ground floor sector (0, 15), the spiral-shaped construction results in a room height of 5.5 m (0, 16) in sector 6 (highest sector of the ground floor). The – due to the form of the polygon - individual graduation in height (0) results in the fact that upon completion of one cycle, the first storey of the new cycle (2, 6) is located on top of the first storey of the preceding cycle (1, 4).
Because of the trapezoid shape of the sectors (7), the building's structure remains unchanged – no matter how small or big the building is going to be. It is furthermore utterly irrelevant whether the building has got the shape of a trigonom or a decagon. If architecturally desired or if necessary because of a particular utilization, some single trapezoid sectors (7) may in some types of polygons differ in size from the other sectors. In an octagon, for instance, the length of the sectors facing each other may be different from that adjacent to them. In this variation of sectors, the round polygonal building turns into an oval polygonal building. The building's sectors, however, always maintain their trapezoid basic structure even though the outer form of the building-ring changes.
Furthermore, the square of the trapezoid leg within a building-ring may be changed. This means that a round or oval polygonal building would turn into an irregular polygonal building with different trapezoid sectors.
The examples described above show that the "Spiralic Construction Method" offers a wide scope for individual architectural design without changing the basic structure of the invention.

When constructing the invented trapezoid polygon building, it is appropriate to start with the erection of the vertical trapezoid leg-side walls, which separate the differently high sectors. The spirally elevating storeys' ceilings are put in between these somehow star-shaped sector walls, which preferably emanate from the center of the building ring. The spiral-shaped, closed building structure alone makes clear that the building cannot "fall" or break down in case of tectonic tremor.

Preferably in the middle of the inner courtyard (8) there is a central staircase building (9). In analogy to the helical storey cycle of the trapezoid sectors, a spiral staircase (9a), which emanates from the basement floor or the subterraneous parking lots, winds up within this central staircase building(9). At the height of the first upper storey (1, 4) the first connecting passage (11) leads from the staircase to this storey (which is on top of the first and thus lowest sector of the ground floor). At an oblique angle from the first and lower connecting passage, the second courtyard passage (17), which emanates from the staircase-building, is some steps higher and leads to the next, already higher located sector or storey (1, 5) of the building around it. After a complete helical cycle, the first connecting passage of the next cycle (18) is at the height of and leads to the 2nd upper storey (2, 6). The height of the "spokes", which each contain the superimposed corridors thus depends on the number of storeys of the building around it. Exits (19) on the central staircase's top (9) provide access to the roofs of the spoke-like crossings (10) which lead to the roof-top terraces of the individual sectors (7).

The central staircase-building (9), which is preferably located in the middle of the polygonal building ring, is an essential part of the "Spiral Construction Method" as it offers considerable advantages for utilization of the building: The connecting passages can be used for various purposes, the distance to remote or opposite sectors of the building is optimized and shortened, and they furthermore improve resistance to tectonic tremor, etc.
However, the solution provided by the invention of trapezoid polygonal sectors (7) does not necessitate a central staircase-building (9) with connecting passages (10) to the surrounding building sectors (7). In practice, it will depend on the concrete requirements and on architectural concepts if and how many passages lead from the central staircase building to the spiral sectors. In a hexagon building-ring it might be appropriate to build three crossings from the central staircase-building to the leg-side area of two adjacent trapezoid sectors, thereby providing access to two storeys with one corridor only.
The dimension of the central staircase (9) as well as the connecting passages (10) to the trapezoid ring sectors (7) will to a large extent depend on the size and the intended utilization of the polygon complex.
In a very large "residential complex-ring", it would make sense, for instance, to construct the connecting passages (10) to the central staircase-building accordingly in size and thus create space for place of works or other facilities. Correspondingly, the central staircase-building as well could be supplied with elevators, escalators and paths for walking or driving. The vicinity to work, apartment, leisure-time facilities etc. could bring about enormous economic and ecologic advantages and increase the psychical and physical well-being of residents and users.
As opposed to usual flats where the roof top usually consists of a more or less uniform, flat and unused surface, the construction of spiral buildings provides a ring-shaped, closed roof-top terrace with different levels from one sector to the other. In order to save resources and, above all, to improve environmental conditions, it seems appropriate to use this ideal terraced structure of spiral buildings for the arrangement of roof-top gardens. This shape of roof is furthermore favourable to the installation of water cisterns in the area of the lowest terrace (22).

Figures

Figure 1 shows the general view of a pentagonal ring-shaped building with 4 storeys and a cylindrical staircase which is located in the center of the inner courtyard and from which connecting passages (crossings, 10) lead to all the sectors (7) or upper storeys (1, 2, 3) of the building complex around it. This figure also shows the trapezoid shape of the individual sectors (7), as well as the fact that the highest and lowest ground-floor sectors are adjacent to each other (0, 15 and 0, 16) as well as the terraced roof-top with its different levels from sector to sector. (12, 22)

Figure 2 shows the ground plan of a pentagonal building ring with its 5 sectors from which spoke-like connecting passages lead to the center of the whole area where the staircase building is located. This pentagon building illustrates very well how the geometric form of an object may be decisive for best possible utilization (as far as incidence of light is concerned, it is most suitable if the apex points towards north).

Figure 3 shows the ground plan of a hexagonal building-ring with an illustration of how an extension (20) of the building ring enlarges the whole complex but does not change the trapezoid structure (7). The access gallery (13), which winds through all storeys at the court-yard side of the ring and due to the helical set-up of storeys has some steps at each intersection of two sectors (14), is depicted in hachures. Dimension and number of sector accesses (10, 21) depend on the size and the intended utilization of the polygon building-ring.

Figure 4 shows the vertical projection of the outer ring's individual sectors in a hexagonal building. It furthermore can be seen that due to the graduated height of the ground floor's individual sectors (0), the upper storeys (1, 2, 3) are superimposed in the shape of a spiral.

The invention is best represented by figures 1 and 3, which should therefore be published together with the summary.

Patent Claim

Spiral ring-type construction with a single spiral central stairwell in building constructions of at least triangular shape with an inner courtyard (8) surrounding a cylindrical central staircase building (9) which is preferably located in the middle and in which the stairs wind up helically (9a) and where the individual trapezoid storeys (1, 2, 3) of the ring-shaped building around it are also spirally superimposed in analogy to the staircase building (9) from which thus all trapezoid sectors (1, 2, 3) can be reached by connecting passages or crossings (10) emanating thereof in a spoke-like form and these building constructions are furthermore **characterized by** the fact that the trapezoid ground-floor sectors (0) of the polygon building ring (7) around an inner courtyard increase in height by a degree that the trapezoid storeys (1, 2, 3) on top of it and preferably of the same height within one floor lead to a set up of storeys that winds upwards in a spiral.

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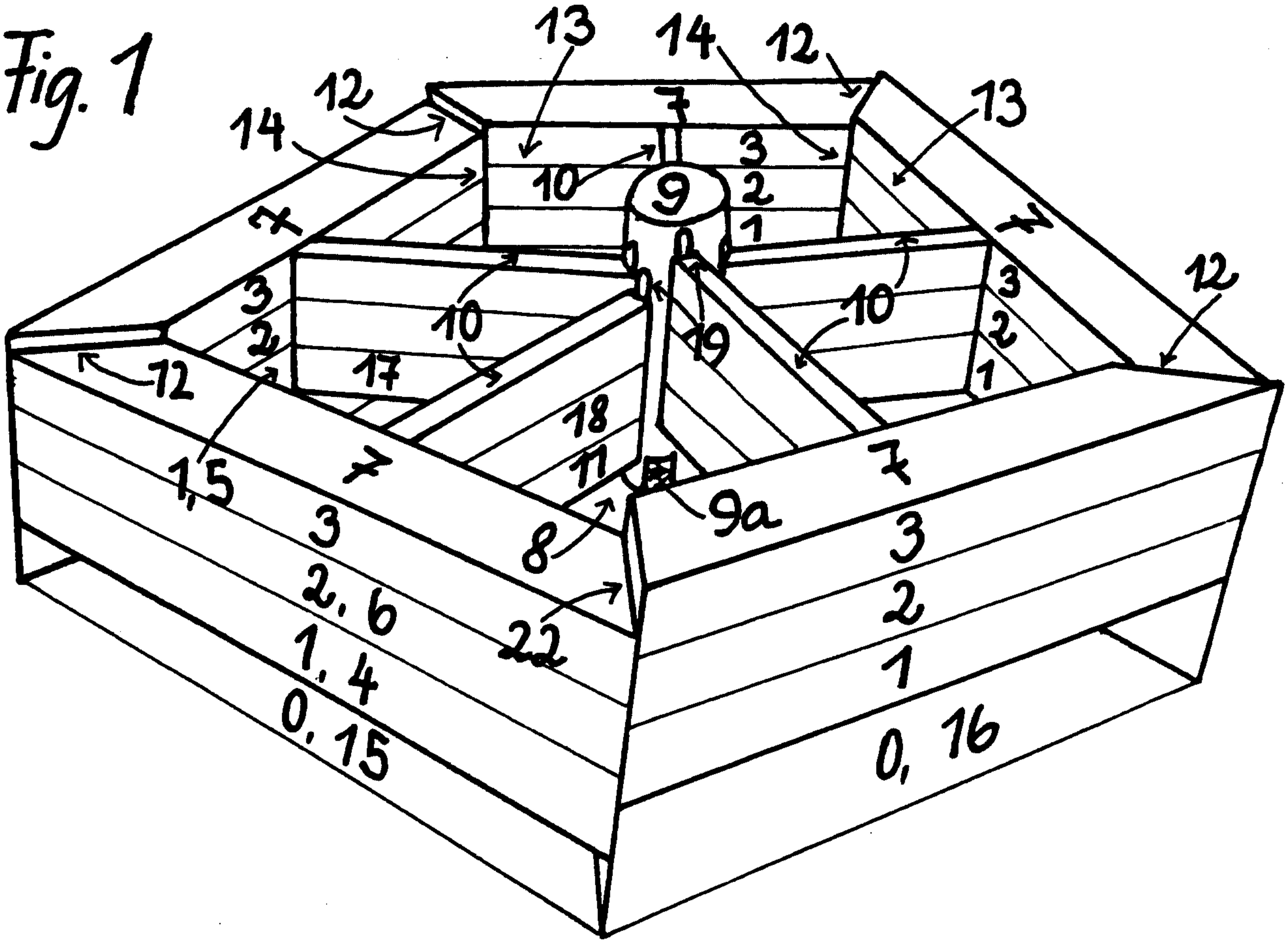
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Fig. 1

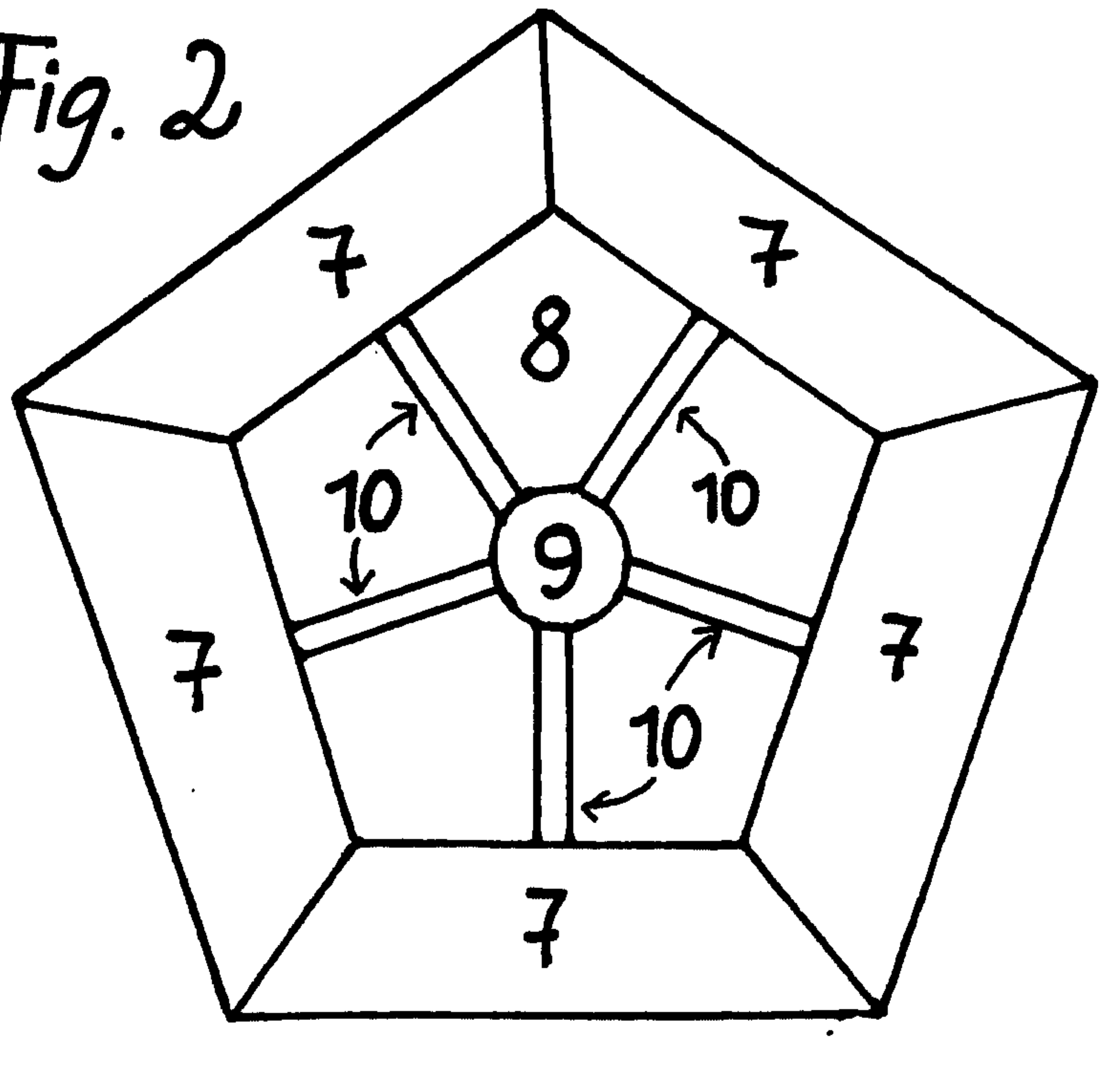
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Fig. 2

Fig. 3

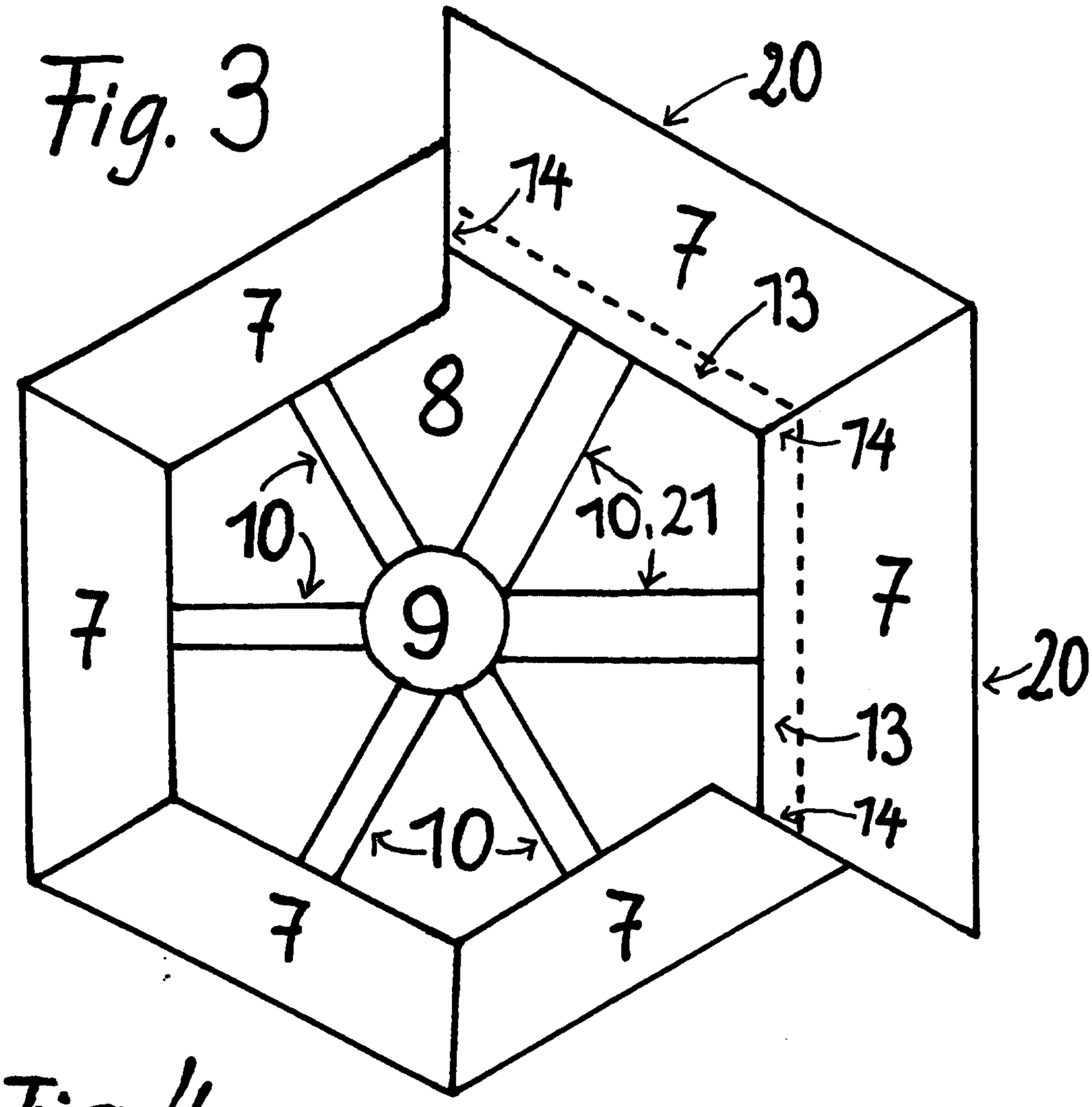
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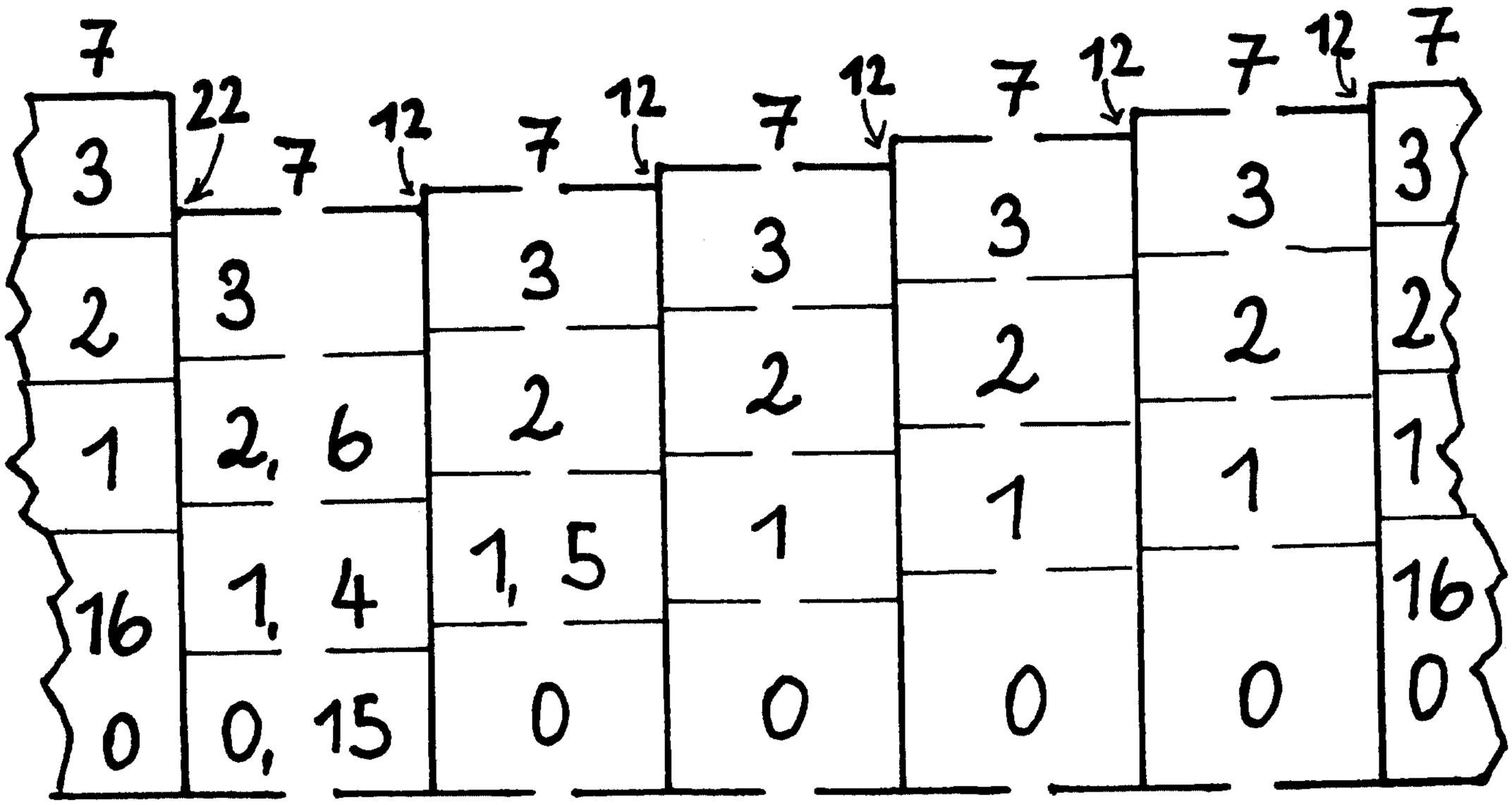
Fig. 4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