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Description

[0001] The invention relates to a formwork system suitable for pouring concrete, which formwork system comprises plate-shaped formwork elements to be positioned substantially transversely to a ground surface, wherein a first set of plate-shaped formwork elements is positioned opposite a second set of plate-shaped formwork elements, substantially parallel thereto and spaced a predetermined distance therefrom.

[0002] The invention further relates to a plate-shaped formwork element which in use is mounted in a formwork system as well as to a method for pouring concrete according to claims 11 and 13, respectively.

[0003] Such a formwork system, which is known from Dutch patent NL1022075C2, comprises a grid arrangement which is placed on a ground surface. The grid arrangement comprises a number of rods extending in longitudinal direction and in a direction transversely thereto. The known formwork further comprises plate-shaped formwork elements which, on a side facing the grid arrangement, are provided with recesses which can be positioned over the transversely extending rods.

[0004] The formwork elements are further oriented in vertical direction relative to the ground surface by means of pins. Opposing formwork elements are connected by means of clamps near the upper side.

[0005] Formwork systems are used, for example, for forming foundation beams on a ground surface prior to the construction of a building. Concrete mortar is poured into the space defined by the formwork elements for forming the foundation beams.

[0006] Since practically all buildings are different in size, practically all foundation beams differ in size as well, in particular as regards their length. A drawback of this known formwork system is the fact that the grid arrangement and the position of the pins determine the relative positions of formwork elements located adjacent to each other. If all formwork elements have the same length, it is difficult to realise a desired length of the formwork with the known formwork system. If the formwork elements differ from each other in length, a large number of different formwork elements are required to realise a desired length.

[0007] The pins are furthermore required for taking up the forces exerted in transverse direction on the formwork elements by the pouring of the concrete mortar. The placement and the removal of the pins is a relatively time-consuming job.

[0008] The object of the invention is to provide a formwork system whose dimensions are easily adjustable, in particular in longitudinal direction, whilst the forces exerted in transverse direction on the formwork elements by the pouring of the concrete mortar can be easily taken up.

[0009] This object is achieved with the formwork system according to the invention in that at least two plate-shaped formwork elements of at least the first set are

each provided with stiffening ribs between a bottom side of the plate-shaped formwork element, which is located near the ground surface, and an upper side of the plate-shaped formwork element, which extends parallel thereto, spaced therefrom by some distance, which stiffening ribs are located on a side of the plate-shaped formwork elements remote from the second set, wherein the two plate-shaped formwork elements, which practically abut against each other, are movable relative to each other in a longitudinal direction parallel to the ground surface.

[0010] The stiffening ribs, which are located between the bottom side and the upper side of the plate-shaped formwork element, prevent deformation of the plate-shaped formwork elements caused by forces exerted in transverse direction during the pouring of the concrete mortar in a simple manner. The stiffening ribs are located between the bottom side and the upper side of the plate-shaped formwork element, whilst it is possible to move two substantially abutting plate-shaped formwork elements in longitudinal direction relative to each other. A first formwork element abuts against an outer side of a second formwork element in that situation. The first formwork element can be moved in longitudinal direction relative to the second formwork element until the first formwork element abuts against the stiffening rib of the second formwork element with a transverse side thereof.

[0011] The first formwork element is preferably provided with a stiffening rib on a side remote from the second formwork element at the location where the first and second formwork elements overlap, which stiffening rib of the first formwork element also prevents deformation of the second formwork element, which abuts against an inner side of the first formwork element, during the pouring of the concrete mortar.

[0012] The formwork elements are preferably made of a metal, such as steel or aluminium, or a plastic material, such as a fibre-reinforced plastic, so that relatively thin formwork elements can be used, as a result of which the dimension of the foundation beam to be constructed will nevertheless be substantially constant in a direction transversely to the longitudinal direction in spite of the partial overlap of the formwork elements.

[0013] One embodiment of the formwork system according to the invention is characterised in that the stiffening ribs extend substantially transversely to the ground surface.

[0014] In this way the formwork element is properly stiffened, whilst in addition the first formwork element can be moved over a relatively large distance with respect to the second formwork elements before the first formwork element abuts against a stiffening rib of the second formwork element with a transverse side thereof.

[0015] Another embodiment of the formwork system according to the invention is characterised in that the plate-shaped formwork element comprises a first and a second transverse side extending transversely to the longitudinal direction, as well as at least two stiffening ribs, wherein a first of the two stiffening ribs is located near

the first transverse side whilst a second of the two stiffening ribs is located near the centre between the first and the second transverse side.

[0016] As a result, the first formwork element can be moved over substantially half the length of the second formwork element relative to the second formwork element, so that a relatively great variation in length of the formwork system can be realised with two formwork elements.

[0017] Another embodiment of the formwork system according to the invention is characterised in that the stiffening ribs of the formwork elements that are located adjacent to each other can be connected to each other.

[0018] Connecting the stiffening ribs of formwork elements located adjacent to each other makes it possible to move the connected formwork elements as a whole and subsequently use them again at another location. This has the advantage that the relative positions of the formwork elements are retained and need not be reset. This is important in particular when forming foundations of a number of identical houses, for example.

[0019] Another embodiment of the formwork system according to the invention is characterised in that the formwork system is provided with spacers to be positioned on a ground surface, which spacers each comprise at least two spaced-apart connecting elements, wherein the opposing formwork elements can be connected to the spaced connecting elements.

[0020] The spacers make it possible in a simple manner to set the spacing between opposing formwork elements in a direction transversely to the longitudinal direction.

[0021] Another embodiment of the formwork system according to the invention is characterised in that the plate-shaped formwork elements are detachably connected to the spacers.

[0022] When the concrete mortar is poured between the plate-shaped formwork elements, the spacers are covered by the concrete mortar. After the pouring of the concrete mortar, the plate-shaped formwork elements can be disconnected from the spacers to be reused for a formwork system to be installed elsewhere.

[0023] Another embodiment of the formwork system according to the invention is characterised in that the spacer is strip-shaped, wherein the connecting elements are U-shaped.

[0024] The plate-shaped formwork elements can be simply placed in the U-shaped connecting elements with a bottom side thereof. Preferably, two overlapping parts of the formwork elements fit in a U-shaped connecting element as well. Because of said U-shape, the formwork elements can be easily removed from the connecting elements.

[0025] Another embodiment of the formwork system according to the invention is characterised in that the plate-shaped formwork element is provided with a flange that extends in longitudinal direction, parallel to the ground surface, which flange can be positioned in the U-

shaped connecting element of the spacer.

[0026] If it must be possible to remove the formwork element after the pouring of the concrete mortar, the flange will extend in a direction away from the space present between the formwork elements. The flange enables the - preferably relatively thin - formwork element to stand unsupported, so that no additional measures are needed for supporting the formwork element temporarily during the installation of the formwork system. The flange provides a stiffening of the formwork element at the bottom side thereof.

[0027] Another embodiment of the formwork system according to the invention is characterised in that formwork elements as well as at least one elongate slat can be detachably positioned in adjacent U-shaped connecting elements of the spacers, which elongate slat is located on the side of the formwork elements that is provided with the stiffening ribs.

[0028] The dimensions of the formwork element, the slat and the U-shaped connecting element are preferably such that after the formwork element and the slat have been placed into the U-shaped-connecting element, the slat will provide an adequate clamping of the formwork element in the U-shaped connecting element. The slat is made of wood, for example, and preferably extends over a number of formwork elements. Deformation of the formwork elements during the pouring of the concrete mortar is prevented in a simple manner also by the slat. If the formwork element is provided with a flange, the slat will preferably be positioned on the flange, so that an additional clamping of the formwork element in the U-shaped connecting element is obtained. After the slat has been removed, the formwork element can be easily removed from the U-shaped connecting element. If the flange has a width which is smaller than a spacing between legs of the U-shaped connecting element, the formwork element abutting against one leg can easily move in the direction of the other leg, so that the formwork element will come free from the poured concrete mortar.

[0029] Another embodiment of the formwork system according to the invention is characterised in that the formwork system comprises U-shaped brackets to be positioned over opposing formwork elements on a side remote from the ground surface, wherein each U-shaped bracket is provided with U-shaped holders, wherein at least one slat can be detachably positioned in adjacent U-shaped holders of the U-shaped brackets.

[0030] The slat is made of wood, for example, and preferably extends over a number of formwork elements. Deformation of the formwork elements during the pouring of the concrete mortar is prevented in a simple manner also by the slat that is positioned at the upper side of the formwork elements.

[0031] The invention also relates to a plate-shaped formwork element suitable for a formwork system as claimed in claim 11 and as described above, which plate-shaped formwork element is provided with stiffening ribs which extend at least partially transversely to a longitu-

dinal direction of the plate-shaped formwork element.

[0032] Deformation of the plate-shaped formwork element is prevented in a simple manner by the stiffening ribs, whilst a relatively thin plate-shaped formwork element, for example made of a metal or a plastic material, can be used, so that a substantially constant dimension in a direction transversely to the longitudinal direction of the foundation beam to be formed is nevertheless realised if plate-shaped formwork elements overlap over a desired distance.

[0033] The invention also relates to a method for pouring concrete, wherein a formwork system as described above is placed on a ground surface, plate-shaped formwork elements are moved relative to each other to a desired relative position, concrete mortar is poured into a space defined by formwork elements of the formwork system, after which the formwork system is at least partially removed.

[0034] Since the plate-shaped formwork elements can be moved relative to each other after placement thereof, any desired length of the formwork system can be realised in a simple manner without there being a need to produce the individual formwork elements to size.

[0035] The invention will now be explained in more detail with reference to the drawings, in which:

Figure 1 is a perspective view of a first embodiment of a formwork system according to the invention;

Figure 2 is a perspective view of a first embodiment of a plate-shaped formwork element according to the invention;

Figure 3 is a perspective view of a second embodiment of a plate-shaped formwork element according to the invention;

Figure 4 is a perspective view of a formwork element of the formwork system according to the invention that is shown in figure 1, which formwork element forms an inside corner;

Figure 5 is a perspective view of a formwork element of the formwork system according to the invention that is shown in figure 1, which formwork element forms an outside corner;

Figure 6 is a perspective view of a U-shaped connecting element of the formwork system according to the invention that is shown in figure 1;

Figure 7 is a perspective view of a U-shaped bracket of the formwork system according to the invention that is shown in figure 1;

Figure 8 is a perspective view of the first embodiment of a formwork system according to the invention shown in figure 1 during the assembly of the formwork system;

Figure 9 is a perspective view of the first embodiment of a formwork system according to the invention that is shown in figure 1 after the pouring of concrete mortar into the formwork system;

Figure 10 is a cross-sectional view of a second embodiment of a formwork system according to the in-

vention after the pouring of concrete mortar into the formwork system;

Figure 11 is a perspective view of a U-shaped connecting element of the formwork system according to the invention that is shown in figure 10;

Figure 12 is a perspective view of a third embodiment of a formwork system according to the invention;

Figures 13A and 13B are perspective views of a second embodiment of a plate-shaped formwork element according to the invention;

Figure 14 is a perspective view of a further embodiment of a U-shaped connecting element;

Figures 15A and 15B are perspective views of a third embodiment of a plate-shaped formwork element according to the invention;

Figure 16 is a perspective view of another embodiment of a U-shaped connecting element.

[0036] Like parts are indicated by the same numerals in the figures.

[0037] Figures 1-9 show a first embodiment of a formwork system 1 according to the invention.

[0038] The formwork system 1 shown in figure 1 comprises four sets 2, 3, 4, 5 of plate-shaped formwork elements 6, 7. The first set 2 of plate-shaped formwork elements 6 extends parallel to the second set 3 of plate-shaped formwork elements 7. The third set 4 of plate-shaped formwork elements 6 extends parallel to the fourth set 5 of plate-shaped formwork elements 7.

[0039] As is clearly shown in figure 2, the formwork element 6 comprises a plate-shaped part 8 which is made of a metal or a plastic material. The plate-shaped part 8 has, for example, a length in x-direction of 0.75 - 1.5 m, preferably 1 m; a height in z-direction of 0.5 - 1 m, preferably 0.65 m, and a thickness in y-direction of 2 - 5 mm, preferably 3 mm.

[0040] Near the bottom side 15 the formwork element 6 is provided with a flange 9 which extends transversely to the plate-shaped part 8. The formwork element 6 is further provided with a first and a second stiffening rib 10, 11. The stiffening ribs 10, 11 extend transversely to the plate-shaped part 8 and in the z-direction. The first stiffening rib 10 is located near a first transverse side 12 of the plate-shaped part 8, whilst the second stiffening rib 11 is located near the centre between the first transverse side 12 and a second transverse side 13 of the plate-shaped part 8. The stiffening ribs 10, 11 extend in the z-direction between an upper side 14 and a bottom side 15 of the plate-shaped part 8, with bevelled ends 16, 17 located spaced from the upper side 14 and the bottom side 15, respectively.

[0041] The stiffening ribs 10, 11 are further provided with passages 18, 19.

[0042] As is clearly shown in figure 3, the formwork element 7 is largely similar to the formwork element 6. The difference between the formwork element 7 and the formwork element 6 is that in the case of the formwork element 6 the first stiffening rib 20 is located near the

second transverse side 13 rather than near the first transverse side 12. In both formwork elements 6 7 the second stiffening rib 11 is located near the centre, between the first transverse side 12 and a second transverse side 13 of the plate-shaped part 8.

[0043] The formwork system 1 shown in figure 1 further comprises angle-shaped formwork elements 21, 22 which, as is clearly shown in figures 4 and 5, are provided with plate-shaped parts 8 that extend transversely to each other. The formwork element 21, which forms an inside corner, is further provided with flanges 9 located in the inside corner of 90 degrees formed by the plate-shaped parts 8. The formwork element 22, which forms an outside corner, is further provided with flanges 9 located in the outside corner of 270 degrees formed by the plate-shaped parts 8.

[0044] The formwork system shown in figure 1 further comprises a number of spacers 23 which, as is clearly shown in figure 6, are provided with a plate-shaped metal strip 24, with U-shaped connecting elements 25 provided at ends of the plate-shaped strip 24. Each connecting element 25 comprises a first leg portion 27, which extends downward, transversely to the plate-shaped strip 24, a second leg portion 27, which extends parallel to the first leg portion 26, and a bridge portion 28, which extends between the leg parts 26, 27, parallel to the plate-shaped strip 24. A passage 29 is provided near the centre of the plate-shaped strip 24.

[0045] The formwork system 1 shown in figure 1 further comprises a number of U-shaped brackets 30 which, as is clearly shown in figure 7, are provided with a plate-shaped metal strip 31, with U-shaped holders 32 provided at ends of the plate-shaped strip 31. Each U-shaped holder 32 comprises a first leg portion 33, which extends downward, transversely to the plate-shaped strip 31, a second leg portion 34, which extends parallel to the first leg portion 33, and a bridge portion 35, which extends between the leg parts 33, 34, parallel to the plate-shaped strip 31.

[0046] The formwork system 1 shown in figure 1 further comprises wooden slats 36, threaded metal rods 37, metal pins 38 and plastic foam plates 39.

[0047] The forming of concrete foundation beams, for example, using the formwork system 1 according to the invention, will now be discussed in more detail with reference to figures 1, 8, 9.

[0048] At the location where the foundation beams are to be formed, insulating plastic foam plates 39 are laid on a ground surface 41 comprising a stable portion 40. The plastic foam plates 39 have a width that equals the spacing between the first legs 26 of the spacers 23. Then a number of spacers are positioned in spaced relationship over the plastic foam plates 39. The spacers 23 are fixed in the ground 41, using metal pins 38. Subsequently, the plate-shaped formwork elements 6, 7 are placed in the U-shaped connecting elements 25, with the formwork elements 6 being positioned opposite to the formwork elements 7. The formwork elements 6 are positioned so

that the part 42 provided with a stiffening rib 10 of a first formwork element 6 abuts with a side remote from the flanged 9 against a part 43 of the second formwork element 6 that is located near the second transverse side 13. The parts 42, 43 of the formwork elements 6 overlap. The adjoining formwork elements 6, the formwork element 22 adjacent thereto, which forms an outside corner, and the formwork elements 6 adjacent thereto are arranged in successive tile-like overlapping relationship.

[0049] Similarly, adjoining formwork elements 7, the formwork element 21 adjacent thereto, which forms an inside corner, and the formwork elements 7 adjacent thereto are arranged in successive overlapping tile-like relationship. The part 44 provided with a stiffening rib 10 of a first formwork element 7 abuts with a side remote from the flanged 9 against a part 45 of a second formwork element 7 that is located near the first transverse side 12.

[0050] The flanges 8 of the formwork elements 6, 7 rest in the U-shaped connecting elements 25. Due to the provision of the flanges 8, the formwork elements 6, 7 can stand independently without any additional support. To realise the desired dimensions of the formwork system 1, the formwork elements 6 can be moved relative to each other in the longitudinal direction L parallel to the formwork elements 6, wherein the first formwork element 6 can be moved relative to the second formwork element 6 until the first transverse side 12 abuts against the central stiffening rib 11 of the second formwork element 6. The same goes for the formwork elements 7.

[0051] Once all the formwork elements 6, 7, 21, 22 have been placed, wooden slats 36 are placed into the U-shaped connecting elements 25, which slats will be supported on the flanges 9, pressing the plate-shaped parts 8 of the formwork elements 6, 7, 21, 22 against the first legs 26 of the U-shaped connecting elements 25.

[0052] Because the ends 16, 17 of the stiffening ribs 10, 11, 20 are spaced from the bottom side 15 and the upper side 14, the slats 36 can be provided over the entire length of the plate-shaped parts 8.

[0053] Subsequently, U-shaped brackets 30 are placed over the upper sides 14 of the formwork elements 6, 7, 21, 22, thereby bringing the plate-shaped parts 8 of the formwork elements 6, 7, 21, 22 into abutment with the facing sides of the first legs 33 of the U-shaped holders 32.

[0054] Wooden slats 36 are laid also in said U-shaped holders 32.

[0055] Following that, concrete mortar can be poured into the space 46 defined by the formwork elements 6, 7, 21, 22. Preferably, pouring is started on that side of the formwork system 1 where the part 43, 45 is directly pressed against the part 42, 44 upon pouring of the concrete mortar. In the formwork system 1 that is shown in figure 1, this is near position A wherein subsequently concrete mortar is poured into the space 46 over the entire length of the formwork system 1. Forces being exerted on the plate-shaped parts 8 by the concrete mortar will be effectively taken up by the stiffening ribs 10, 11

that extend transversely to the longitudinal direction L and the wooden slats 36 and flanges 9 that extend in the longitudinal direction L, with substantially no deformations of the plate-shaped parts 8. As a result, the foundation beam 47 thus formed, as shown in figure 9, will have the desired shape. If the plate-shaped parts 8 were to deform, this would make it necessary to use additional concrete mortar so as to obtain the same desired height in z-direction. Moreover, deformed plate-shaped parts 8 can no longer be reused.

[0056] In the formwork system 1, first the slats 36, then the brackets 30 and subsequently the plate-shaped formwork elements 6, 7, 21, 22 are removed after curing of the poured concrete mortar. If desired, the formwork elements 6, 7, 21, 22 can be connected together by means of threaded rods 37 extending through the passages 18, 19, which are connected to the stiffening ribs 10, 11, 20, as a result of which a number of interconnected formwork elements 6, 22; 7, 21 can be jointly moved to another position for forming an identical foundation beam 47.

[0057] Figure 10 shows a second embodiment of a formwork system 51 according to the invention. The formwork system 51 is different from the formwork 1 in that it is provided with spacers 52 which, as is clearly shown in figure 11, are provided with a plate-shaped metal strip 53, with U-shaped connecting elements 54 provided at ends of the plate-shaped strip 53. Each connecting element 54 comprises a first leg portion 55, which extends transversely to the plate-shaped strip 53, and a second leg portion 56, which extends parallel to the first leg portion 53. A passage 57 is provided near the centre of the plate-shaped strip 53.

[0058] The formwork system 51 is suitable for use on a ground surface 41 where no plastic foam plates 39 are used and the foundation beam 47 lies directly on the ground surface 41.

[0059] It is also possible that the stiffening ribs include an angle of, for example, 45 degrees with the longitudinal direction.

[0060] Figures 12-14 show a third embodiment of a formwork system 61 according to the invention.

[0061] The formwork system 61 is different from the formwork system 1 as regards the configuration of the plate-shaped formwork elements 62 and the U-shaped connecting elements 63. The formwork system 61 further functions similarly to the formwork system 1.

[0062] As is clearly shown in figures 13A and 13B, the plate-shaped formwork element 62 is provided with two tubular stiffening ribs 64, which are evenly spaced from the nearby transverse side 65.

[0063] As is clearly shown in figure 14, the U-shaped connecting element 63 is made of a wire-shaped material, such as steel wire, for example. The U-shaped connecting element 63 is otherwise similar to the U-shaped connecting element 23.

[0064] Figures 15A and 15B show another embodiment of a plate-shaped formwork element 66 which is provided with three tubular stiffening ribs 67, with the

middle stiffening rib 67 being located near the centre of the plate-shaped part 8 and the stiffening ribs 67 being present on either side thereof, evenly spaced from the nearby transverse side 68.

[0065] The plate 8 is connected to a side 69 of an angle section 70 at the bottom side, whilst a second side of the angle section 70 forms the flange 9. The angle section 70 and the plate 8 may be welded, bolted or glued together or be joined together by other means.

[0066] In this way a flat plate 8 can be used, after which the plate 8 is provided with the flange 9 by connecting the angle section 70 and the plate 8 together.

[0067] Such an embodiment is for example suitable for use if the plate 8 is made of plastic material, such as plastic-reinforced glass fibre. Also the angle section 70 and the tubular stiffening ribs 67 may be made of plastic material in that case.

[0068] Figure 16 shows another embodiment of a U-shaped connecting element 71 which is made of a wire-shaped material, such as steel wire, for example. The U-shaped connecting element 71 is otherwise similar to the U-shaped connecting element 11.

List of reference numerals

25	[0069]	
	1	formwork system
	2	set
30	3	set
	4	set
	5	set
	6	formwork element
	7	formwork element
35	8	part
	9	flange
	10	stiffening rib
	11	stiffening rib
	12	transverse side
40	13	transverse side
	14	upper side
	15	bottom side
	16	end
	17	end
45	18	passage
	19	passage
	20	stiffening rib
	21	formwork element
	22	formwork element
50	23	spacer
	24	strip
	25	connecting element
	26	first leg portion
	27	second leg portion
55	28	bridge portion
	29	passage
	30	bracket
	31	strip

32	holder		
33	first leg portion		
34	second leg portion		
35	bridge portion		
36	slat	5	
37	threaded rod		
38	pin		
39	plate		
40	part		
41	ground surface	10	
42	part		
43	part		
44	part		
45	part		
46	space	15	
47	foundation beam		
51	formwork system		
52	spacer		
53	strip		
54	connecting element	20	
55	first leg portion		
56	second leg portion		
57	passage		
61	formwork system		
62	formwork element	25	
63	connecting element		
64	stiffening rib		
65	transverse side		
66	formwork element		
67	stiffening rib	30	
68	transverse side		
69	side		
70	angle section		
71	connecting element		
L	longitudinal direction	35	
A	position		

Claims

1. A formwork system (1, 51, 61) suitable for pouring concrete, which formwork system (1, 51, 61) comprises plate-shaped formwork elements (6, 7, 62, 66) to be positioned substantially transversely to a ground surface, wherein a first set (2, 3, 4, 5) of plate-shaped formwork elements is positioned opposite a second set (2, 3, 4, 5) of plate-shaped formwork elements (6, 7, 62, 66), substantially parallel thereto and spaced a predetermined distance therefrom, **characterised in that** at least two plate-shaped formwork elements (6, 7, 62, 66) of at least the first set (2, 3, 4, 5) are each provided with stiffening ribs (10, 11, 20, 64, 67) between a bottom side (15) of the plate-shaped formwork element, which is located near the ground surface, and an upper side (14) of the plate-shaped formwork element, which extends parallel thereto, spaced therefrom by some distance, which stiffening ribs (10, 11, 20, 64, 67) are located on a side of the plate-shaped formwork elements (6, 7, 62, 66) remote from the second set (2, 3, 4, 5), wherein the two plate-shaped formwork elements (6, 7, 62, 66), which practically abut against each other, are movable relative to each other in a longitudinal direction (L) parallel to the ground surface.
2. A formwork system (1, 51, 61) according to claim 1, **characterised in that** the stiffening ribs (10, 11, 20, 64, 67) extend substantially transversely to the ground surface.
3. A formwork system (1, 51, 61) according to claim 2, **characterised in that** the plate-shaped formwork element comprises a first and a second transverse side (12, 13, 65, 68) extending transversely to the longitudinal direction, as well as at least two stiffening ribs (10, 11, 20, 64, 67), wherein a first of the two stiffening ribs (10, 20, 67) is located near the first transverse side whilst a second of the two stiffening ribs (11, 67) is located near the centre between the first and the second transverse side (12, 13, 68).
4. A formwork system (1, 51, 61) according to any one of the preceding claims, **characterised in that** the stiffening ribs (10, 11, 20, 64, 67) of the formwork elements (6, 7, 62, 66) that are located adjacent to each other can be connected to each other.
5. A formwork system (1, 51, 61) according to any one of the preceding claims, **characterised in that** the formwork system (1) is provided with spacers (23, 52) to be positioned on a ground surface, which spacers each comprise at least two spaced-apart connecting elements (25, 54, 63, 71), wherein the opposing formwork elements (6, 7, 62, 66) positioned can be connected to the spaced connecting elements (25, 54, 63, 71).
6. A formwork system (1, 51, 61) according to claim 5, **characterised in that** the plate-shaped formwork elements (6, 7, 62, 66) are detachably connected to the spacers (23, 52).
7. A formwork system (1, 51, 61) according to claim 5 or 6, **characterised in that** the spacer (23, 52) is strip-shaped, wherein the connecting elements (25, 54, 63, 71) are U-shaped.
8. A formwork system (1, 51, 61) according to claim 7, **characterised in that** the plate-shaped formwork element (6, 7, 62, 66) is provided with a flange (9) that extends in longitudinal direction (L), parallel to the ground surface, which flange (9) can be positioned in the U-shaped connecting element (25, 54, 63, 71) of the spacer (23, 52).
9. A formwork system (1, 51, 61) according to claim 7

or 8, **characterised in that** formwork elements (6, 7, 62, 66) as well as at least one elongate slat (36) can be detachably positioned in adjacent U-shaped connecting elements (25, 54, 63, 71) of the spacers (23, 52), which elongate slat (36) is located on the side of the formwork elements (6, 7) that is provided with the stiffening ribs (10, 11, 20, 64, 67).

10. A formwork system (1, 51, 61) according to any one of the preceding claims, **characterised in that** the formwork system (1) comprises U-shaped brackets (30) to be positioned over opposing formwork elements (6, 7, 62, 66) on a side remote from the ground surface, wherein each U-shaped bracket (30) is provided with U-shaped holders (32), wherein at least one slat (36) can be detachably positioned in adjacent U-shaped holders (32) of the U-shaped brackets.
11. A plate-shaped formwork element (6, 7, 62, 66) in use mounted in a formwork system (1, 51, 61) according to any one of the preceding claims, which plate-shaped formwork element (6, 7, 62, 66) is provided with stiffening ribs (10, 11, 20, 64, 67) which extend at least partially transversely to a longitudinal direction (L) of the plate-shaped formwork element (6, 7, 62, 66).
12. A plate-shaped formwork element (6, 7, 62, 66) according to claim 11, **characterised in that** the plate-shaped formwork element (6, 7, 62, 66) is provided with a flange (9) that extends parallel to the longitudinal direction (L), transversely to a plate-shaped part (8) of the formwork element.
13. A method for pouring concrete, wherein a formwork system (1, 51, 61) according to any one of the preceding claims 1-10 is placed on a ground surface, plate-shaped formwork elements (6, 7, 62, 66) are moved relative to each other to a desired relative position, concrete mortar is poured into a space (46) defined by formwork elements (6, 7, 62, 66) of the formwork system (1, 51, 61), after which the formwork system (1, 51, 61) is at least partially removed.
14. A method according to claim 13, **characterised in that** after the connected-together formwork elements (6, 7, 62, 66) have been used on the ground surface, said connected-together formwork elements (6, 7, 62, 66) can be positioned elsewhere on the ground surface.

Patentansprüche

1. Schalungssystem (1, 51, 61), das zum Einbringen von Beton geeignet ist, wobei das Schalungssystem (1, 51, 61) plattenförmige Schalungselemente (6, 7,

62, 66) zur Positionierung im Wesentlichen transversal zu einer Bodenoberfläche umfasst, wobei ein erster Satz (2, 3, 4, 5) plattenförmiger Schalungselemente gegenüber einem zweiten Satz (2, 3, 4, 5) plattenförmiger Schalungselemente (6, 7, 62, 66) positioniert ist, im Wesentlichen parallel dazu und in einer vorbestimmten Distanz davon beabstandet ist, **dadurch gekennzeichnet, dass** mindestens zwei plattenförmige Schalungselemente (6, 7, 62, 66) mindestens des ersten Satzes (2, 3, 4, 5) jeweils mit Versteifungsrippen (10, 11, 20, 64, 67) zwischen einer unteren Seite (15) des plattenförmigen Schalungselements, die nahe der Bodenoberfläche angeordnet ist, und einer oberen Seite (14) des plattenförmigen Schalungselements, die parallel dazu, um eine gewisse Distanz davon beabstandet verläuft, versehen sind, wobei die Versteifungsrippen (10, 11, 20, 64, 67) an einer von dem zweiten Satz (2, 3, 4, 5) entfernten Seite der plattenförmigen Schalungselemente (6, 7, 62, 66) angeordnet sind, wobei die zwei plattenförmigen Schalungselemente (6, 7, 62, 66), die praktisch gegeneinander anliegen, relativ zueinander in einer Längsrichtung (L) parallel zu der Bodenoberfläche beweglich sind.

2. Schalungssystem (1, 51, 61) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Versteifungsrippen (10, 11, 20, 64, 67) im Wesentlichen transversal zu der Bodenoberfläche verlaufen.
3. Schalungssystem (1, 51, 61) gemäß Anspruch 2, **dadurch gekennzeichnet, dass** das plattenförmige Schalungselement eine erste und eine zweite transversale Seite (12, 13, 65, 68), die transversal zu der Längsrichtung verlaufen, sowie mindestens zwei Versteifungsrippen (10, 11, 20, 64, 67) umfasst, wobei eine erste der zwei Versteifungsrippen (10, 20, 67) in der Nähe der ersten transversalen Seite angeordnet ist, während eine zweite der zwei Versteifungsrippen (11, 67) in der Nähe der Mitte zwischen der ersten und der zweiten transversalen Seite (12, 13, 68) angeordnet ist.
4. Schalungssystem (1, 51, 61) gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Versteifungsrippen (10, 11, 20, 64, 67) der Schalungselemente (6, 7, 62, 66), die zueinander benachbart angeordnet sind, miteinander verbindbar sind.
5. Schalungssystem (1, 51, 61) gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** das Schalungssystem (1) mit Abstandhaltern (23, 52) zur Positionierung auf einer Bodenoberfläche versehen ist, wobei die Abstandhalter jeweils mindestens zwei beabstandete Verbindungselemente (25, 54, 63, 71) umfassen, wobei die positionierten gegenüberliegenden Schalungselemente (6,

- 7, 62, 66) mit den beabstandeten Verbindungselementen (25, 54, 63, 71) verbindbar sind.
6. Schalungssystem (1, 51, 61) gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die plattenförmigen Schalungselemente (6, 7, 62, 66) lösbar mit den Abstandhaltern (23, 52) verbunden sind. 5
7. Schalungssystem (1, 51, 61) gemäß Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** der Abstandhalter (23, 52) streifenförmig ist, wobei die Verbindungselemente (25, 54, 63, 71) U-förmig sind. 10
8. Schalungssystem (1, 51, 61) gemäß Anspruch 7, **dadurch gekennzeichnet, dass** das plattenförmige Schalungselement (6, 7, 62, 66) mit einem Flansch (9) versehen ist, der in Längsrichtung (L), parallel zu der Bodenoberfläche, verläuft, wobei der Flansch (9) in dem U-förmigen Verbindungselement (25, 54, 63, 71) des Abstandhalters (23, 52) positioniert sein kann. 15 20
9. Schalungssystem (1, 51, 61) gemäß Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** Schalungselemente (6, 7, 62, 66) sowie mindestens eine längliche Leiste (36) lösbar in benachbarten U-förmigen Verbindungselementen (25, 54, 63, 71) der Abstandhalter (23, 52) positioniert sein können, wobei die längliche Leiste (36) an der Seite der Schalungselemente (6, 7) angeordnet ist, die mit den Versteifungsrippen (10, 11, 20, 64, 67) versehen ist. 25 30
10. Schalungssystem (1, 51, 61) gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** das Schalungssystem (1) U-förmige Halterungen (30) zur Positionierung über gegenüberliegenden Schalungselementen (6, 7, 62, 66) an einer von der Bodenoberfläche entfernten Seite umfasst, wobei jede U-förmige Halterung (30) mit U-förmigen Haltern (32) versehen ist, wobei mindestens eine Leiste (36) lösbar in benachbarten U-förmigen Haltern (32) der U-förmigen Halterungen positioniert sein kann. 35 40
11. Plattenförmiges Schalungselement (6, 7, 62, 66), das in Verwendung in einem Schalungssystem (1, 51, 61) gemäß einem der vorstehenden Ansprüche angebracht ist, wobei das plattenförmige Schalungselement (6, 7, 62, 66) mit Versteifungsrippen (10, 11, 20, 64, 67) versehen ist, die mindestens teilweise transversal zu einer Längsrichtung (L) des plattenförmigen Schalungselements (6, 7, 62, 66) verlaufen. 45 50
12. Plattenförmiges Schalungselement (6, 7, 62, 66) gemäß Anspruch 11, **dadurch gekennzeichnet, dass** das plattenförmige Schalungselement (6, 7, 62, 66) mit einem Flansch (9) versehen ist, der parallel zu

der Längsrichtung (L), transversal zu einem plattenförmigen Teil (8) des Schalungselements verläuft.

13. Verfahren zum Einbringen von Beton, bei dem ein Schalungssystem (1, 51, 61) gemäß einem der vorstehenden Ansprüche 1 - 10 auf einer Bodenoberfläche platziert wird, plattenförmige Schalungselemente (6, 7, 62, 66) relativ zueinander an eine gewünschte relative Position bewegt werden, Betonmörtel in einen Raum (46) eingebracht wird, der durch Schalungselemente (6, 7, 62, 66) des Schalungssystems (1, 51, 61) bestimmt ist, wonach das Schalungssystem (1, 51, 61) mindestens teilweise entfernt wird. 5 10 15
14. Verfahren gemäß Anspruch 13, **dadurch gekennzeichnet, dass**, nachdem die miteinander verbundenen Schalungselemente (6, 7, 62, 66) auf der Bodenoberfläche verwendet wurden, die miteinander verbundenen Schalungselemente (6, 7, 62, 66) an einer anderen Stelle auf der Bodenoberfläche positioniert werden können. 20

25 Revendications

1. Système de coffrage (1, 51, 61) adapté pour couler du béton, lequel système de coffrage (1, 51, 61) comprend des éléments de coffrage en forme de plaque (6, 7, 62, 66) à positionner sensiblement transversalement par rapport à une surface de sol, dans lequel un premier ensemble (2, 3, 4, 5) d'éléments de coffrage en forme de plaque est positionné à l'opposé d'un second ensemble (2, 3, 4, 5) d'éléments de coffrage en forme de plaque (6, 7, 62, 66), de manière sensiblement parallèle à celui-ci et espacé d'une distance prédéterminée de celui-ci, **caractérisé en ce qu'**au moins deux éléments de coffrage en forme de plaque (6, 7, 62, 66) d'au moins le premier ensemble (2, 3, 4, 5) sont pourvus chacun de nervures de renforcement (10, 11, 20, 64, 67) entre un côté inférieur (15) de l'élément de coffrage en forme de plaque, qui est disposé à proximité de la surface du sol, et un côté supérieur (14) de l'élément de coffrage en forme de plaque qui s'étend parallèlement à celui-ci, espacé d'une certaine distance de celui-ci, lesquelles nervures de renforcement (10, 11, 20, 64, 67) sont disposées sur un côté des éléments de coffrage en forme de plaque (6, 7, 62, 66) à distance du second ensemble (2, 3, 4, 5), dans lequel les deux éléments de coffrage en forme de plaque (6, 7, 62, 66) qui butent pratiquement l'un contre l'autre, sont mobiles l'un par rapport à l'autre dans une direction longitudinale (L) parallèle à la surface du sol. 35 40 45 50
2. Système de coffrage (1, 51, 61) selon la revendication 1, **caractérisé en ce que** les nervures de ren-

- forcement (10, 11, 20, 64, 67) s'étendent sensiblement transversalement à la surface du sol.
3. Système de coffrage (1, 51, 61) selon la revendication 2, **caractérisé en ce que** l'élément de coffrage en forme de plaque comprend un premier et un second côté transversal (12, 13, 65, 68) s'étendant transversalement à la direction longitudinale, ainsi qu'au moins deux nervures de renforcement (10, 11, 20, 64, 67), dans lequel une première des deux nervures de renforcement (10, 20, 67) est disposée à proximité du premier côté transversal tandis qu'une seconde des deux nervures de renforcement (11, 67) est disposée à proximité du centre entre le premier et le second côté transversal (12, 13, 68).
 4. Système de coffrage (1, 51, 61) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les nervures de renforcement (10, 11, 20, 64, 67) des éléments de coffrage (6, 7, 62, 66) qui sont disposées de manière adjacente les unes aux autres peuvent être reliées les unes aux autres.
 5. Système de coffrage (1, 51, 61) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système de coffrage (1) est doté d'éléments d'espacement (23, 52) à positionner sur une surface de sol, lesquels éléments d'espacement comprennent chacun au moins deux éléments de connexion espacés (25, 54, 63, 71), dans lequel les éléments de coffrage opposés (6, 7, 62, 66) installés peuvent être reliés aux éléments de connexion espacés (25, 54, 63, 71).
 6. Système de coffrage (1, 51, 61) selon la revendication 5, **caractérisé en ce que** les éléments de coffrage en forme de plaque (6, 7, 62, 66) sont reliés de manière amovible aux éléments d'espacement (23, 52).
 7. Système de coffrage (1, 51, 61) selon la revendication 5 ou 6, **caractérisé en ce que** l'élément d'espacement (23, 52) est en forme de bande, dans lequel les éléments de connexion (25, 54, 63, 71) sont en forme de U.
 8. Système de coffrage (1, 51, 61) selon la revendication 7, **caractérisé en ce que** l'élément de coffrage en forme de plaque (6, 7, 62, 66) est doté d'une bride (9) qui s'étend dans la direction longitudinale (L), parallèlement à la surface du sol, laquelle bride (9) peut être positionnée dans l'élément de connexion en forme de U (25, 54, 63, 71) de l'élément d'espacement (23, 52).
 9. Système de coffrage (1, 51, 61) selon la revendication 7 ou 8, **caractérisé en ce que** des éléments de coffrage (6, 7, 62, 66) ainsi qu'au moins une latte allongée (36) peuvent être positionnés de manière amovible dans des éléments de connexion en forme de U adjacents (25, 54, 63, 71) des éléments d'espacement (23, 52), laquelle latte allongée (36) est disposée sur le côté des éléments de coffrage (6, 7) qui est doté des nervures de renforcement (10, 11, 20, 64, 67).
 10. Système de coffrage (1, 51, 61) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le système de coffrage (1) comprend des supports en forme de U (30) à positionner au-dessus d'éléments de coffrage opposés (6, 7, 62, 66) sur un côté distant de la surface du sol, dans lequel chaque support en forme de U (30) est doté d'éléments de retenue en forme de U (32), dans lequel au moins une latte (36) peut être positionnée de manière amovible dans des éléments de retenue en forme de U adjacents (32) des supports en forme de U.
 11. Élément de coffrage en forme de plaque (6, 7, 62, 66), monté lors de l'utilisation dans un système de coffrage (1, 51, 61) selon l'une quelconque des revendications précédentes, lequel élément de coffrage en forme de plaque (6, 7, 62, 66) est doté de nervures de renforcement (10, 11, 20, 64, 67) qui s'étendent au moins partiellement transversalement à une direction longitudinale (L) de l'élément de coffrage en forme de plaque (6, 7, 62, 66).
 12. Élément de coffrage en forme de plaque (6, 7, 62, 66) selon la revendication 11, **caractérisé en ce que** l'élément de coffrage en forme de plaque (6, 7, 62, 66) est doté d'une bride (9) qui s'étend parallèlement à la direction longitudinale (L), transversalement à une pièce en forme de plaque (8) de l'élément de coffrage.
 13. Procédé pour couler du béton, dans lequel un système de coffrage (1, 51, 61) selon l'une quelconque des revendications précédentes 1 à 10 est disposé sur une surface de sol, des éléments de coffrage en forme de plaque (6, 7, 62, 66) sont déplacés les uns par rapport aux autres à une position relative souhaitée, du mortier de béton est coulé dans un espace (46) défini par les éléments de coffrage (6, 7, 62, 66) du système de coffrage (1, 51, 61), suite à quoi le système de coffrage (1, 51, 61) est au moins partiellement retiré.
 14. Procédé selon la revendication 13, **caractérisé en ce qu'**après que les éléments de coffrage connectés les uns aux autres (6, 7, 62, 66) ont été utilisés sur la surface du sol, lesdits éléments de coffrage connectés les uns aux autres (6, 7, 62, 66) peuvent être positionnés ailleurs sur la surface du sol.

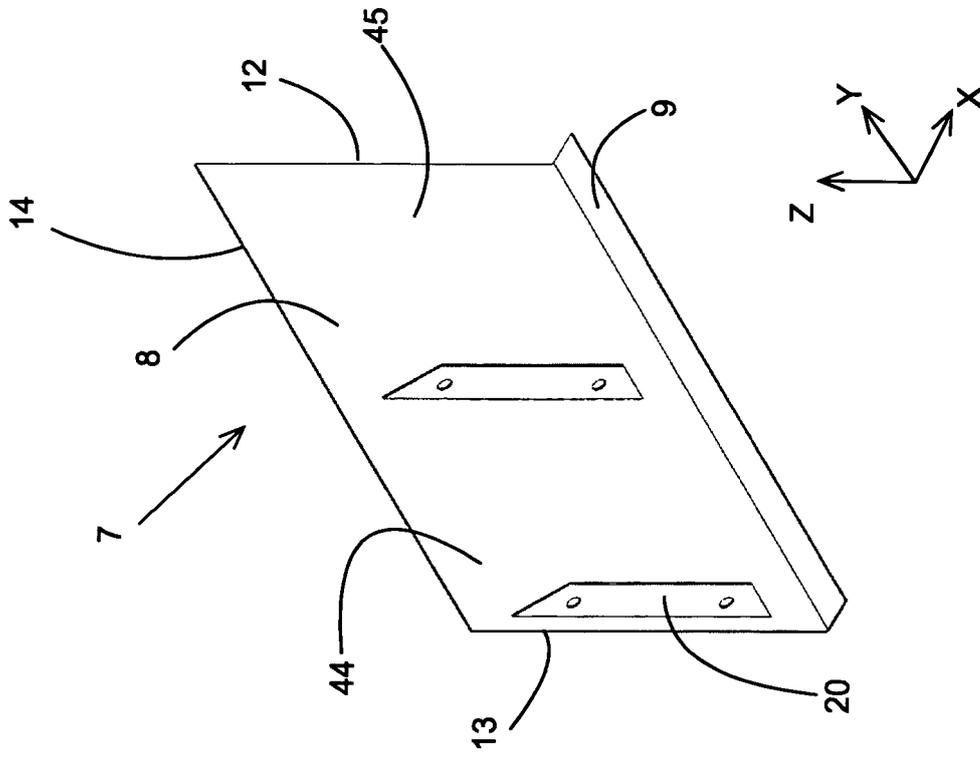


Fig. 2

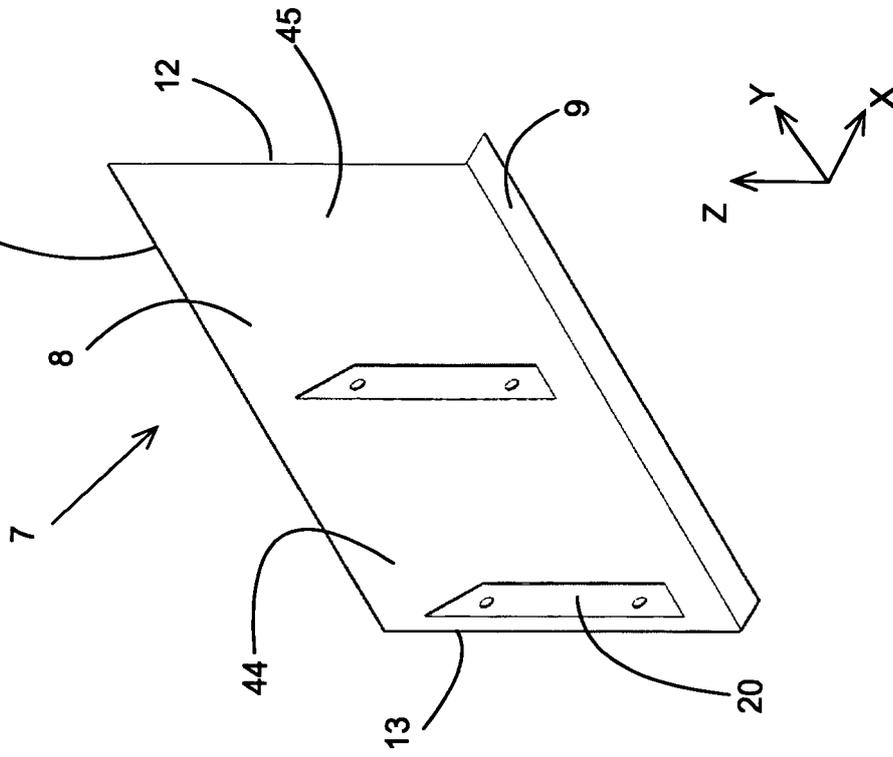


Fig. 3

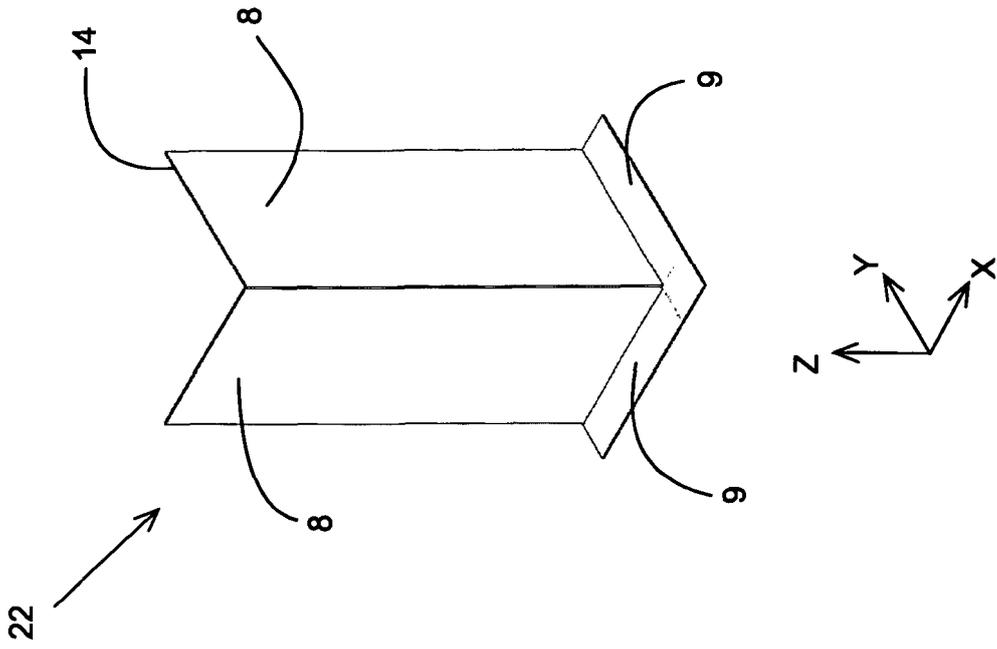


Fig. 5

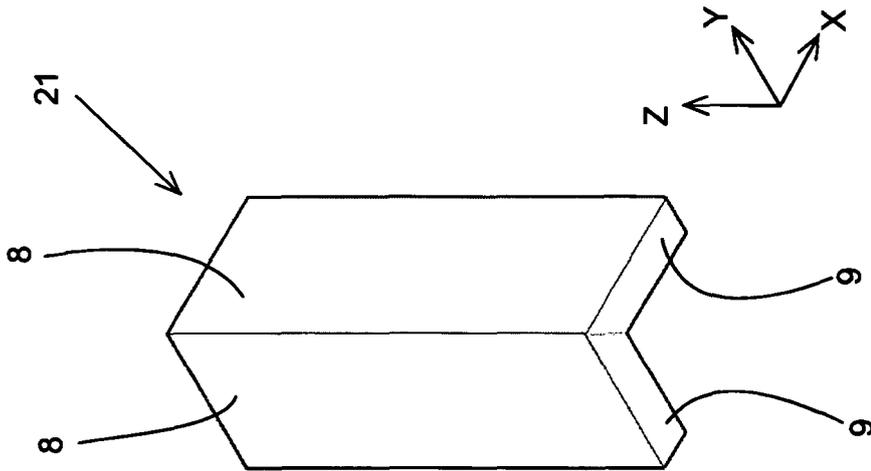


Fig. 4

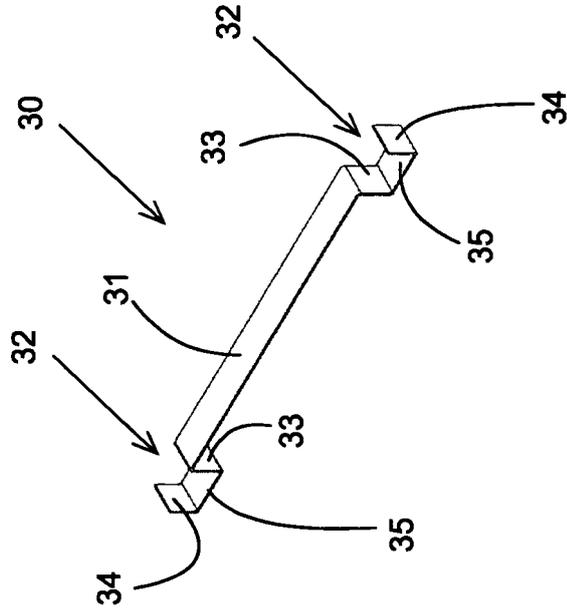


Fig. 7

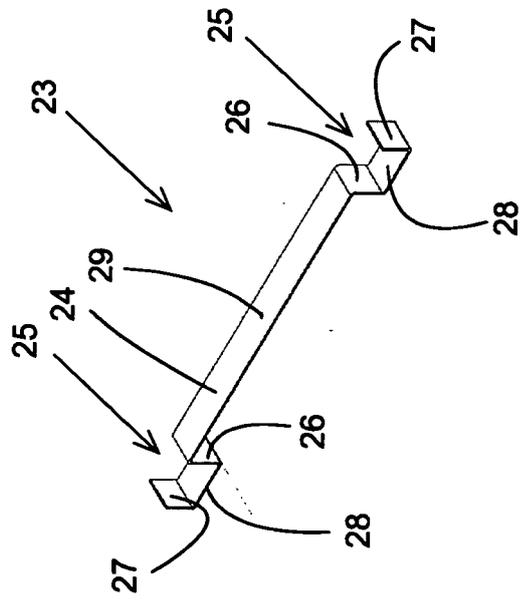


Fig. 6

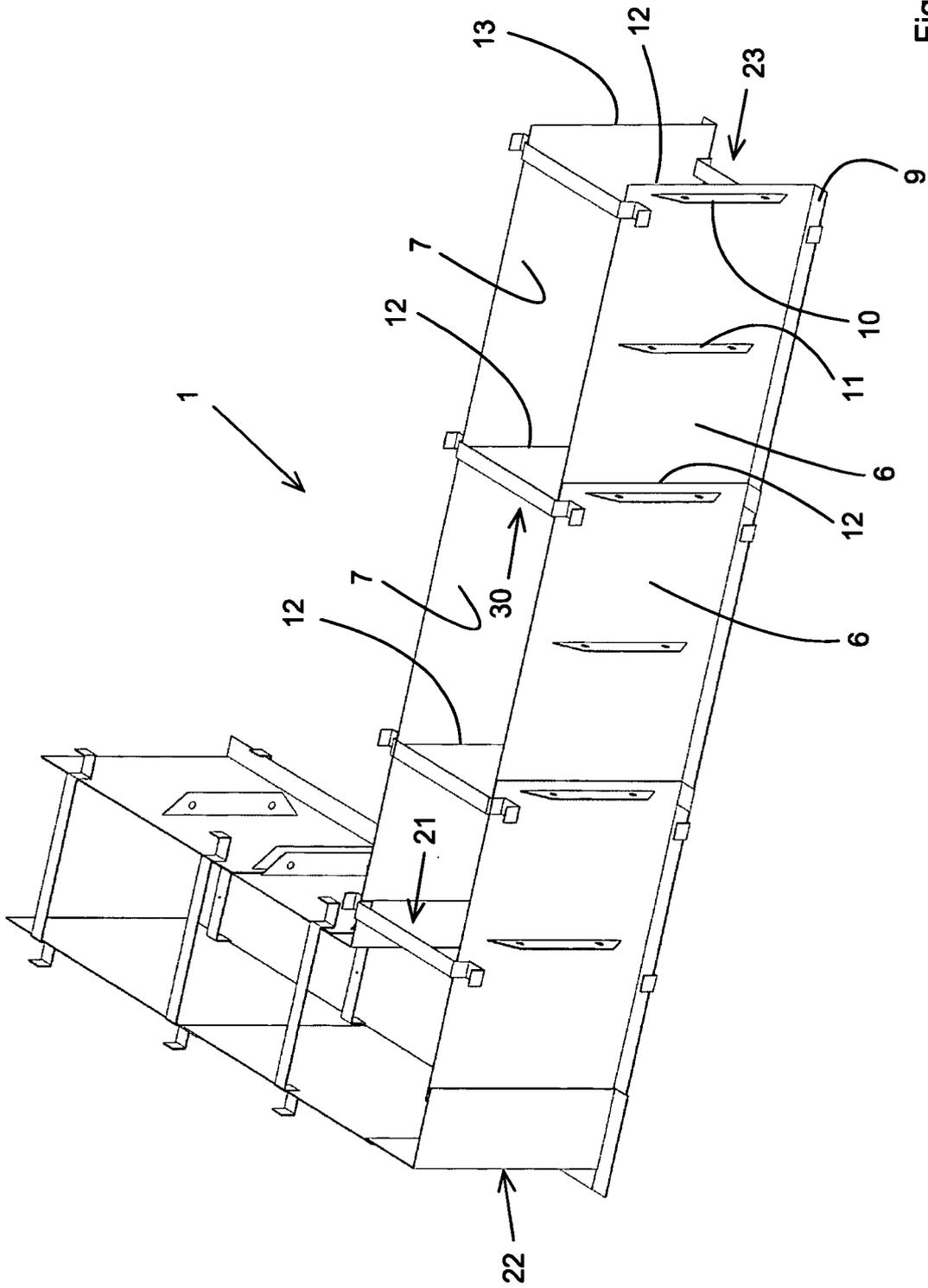


Fig. 8

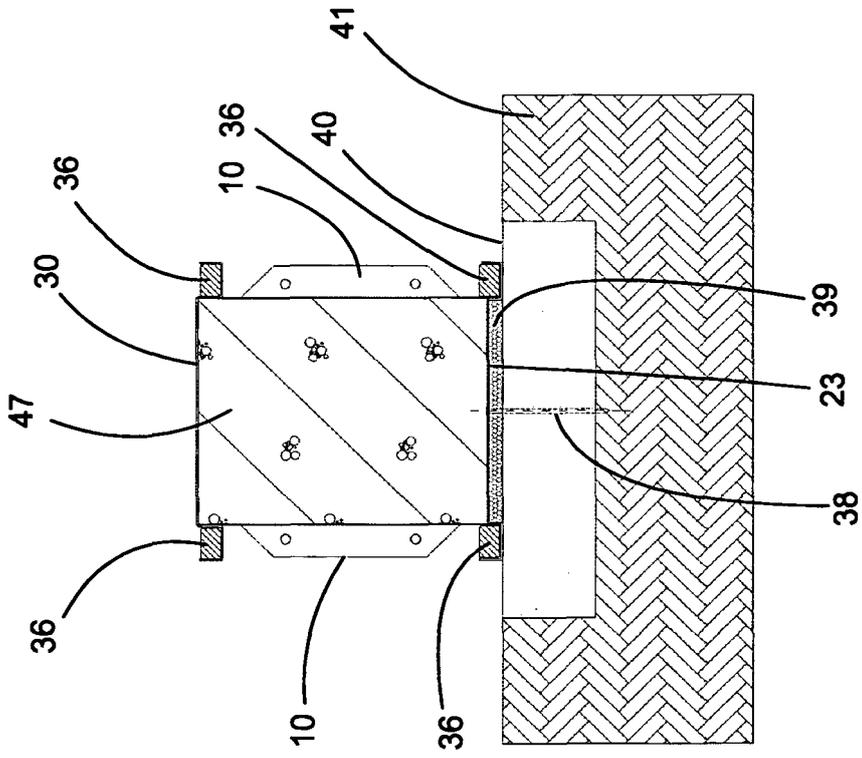


Fig. 9

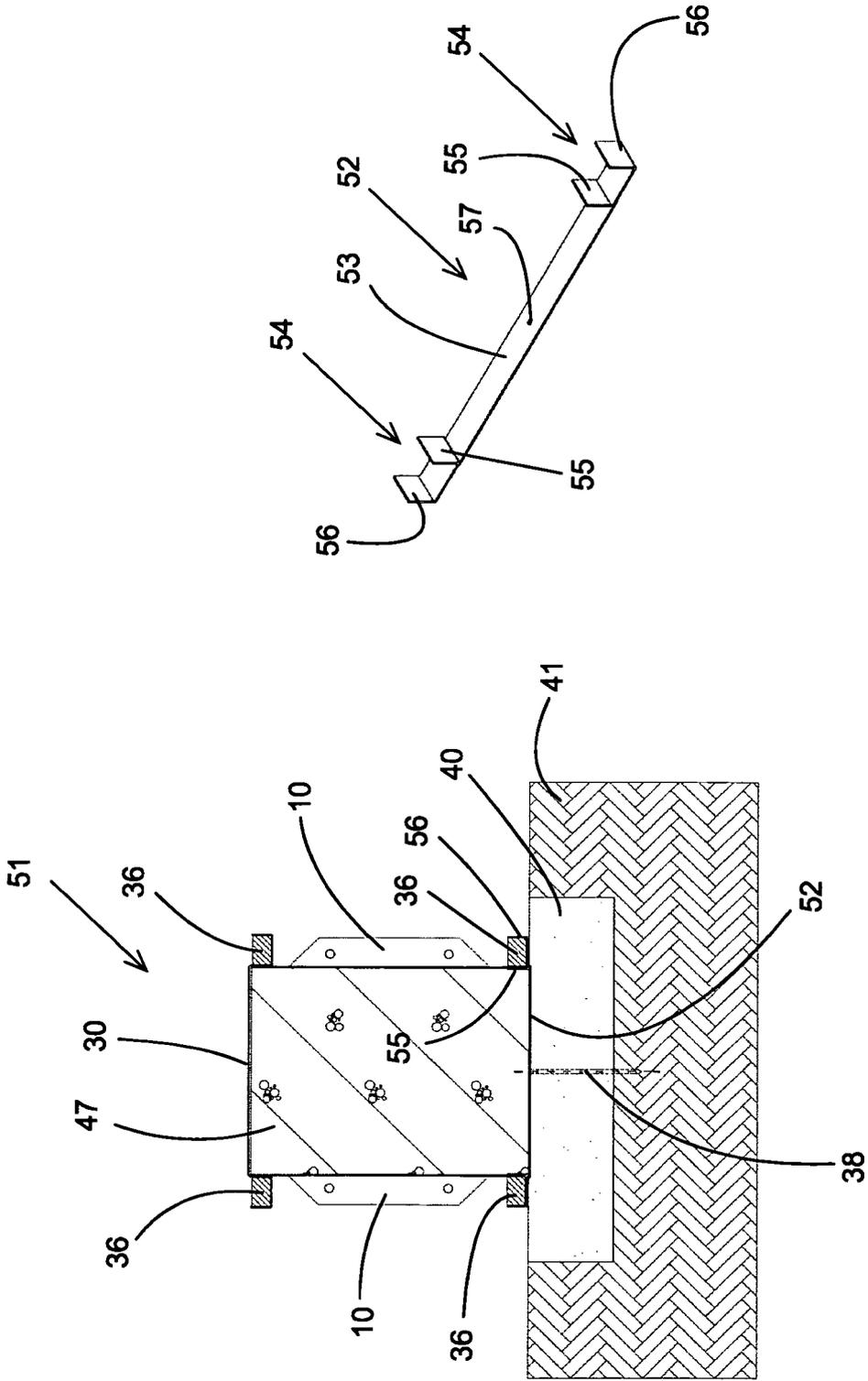


Fig. 10

Fig. 11

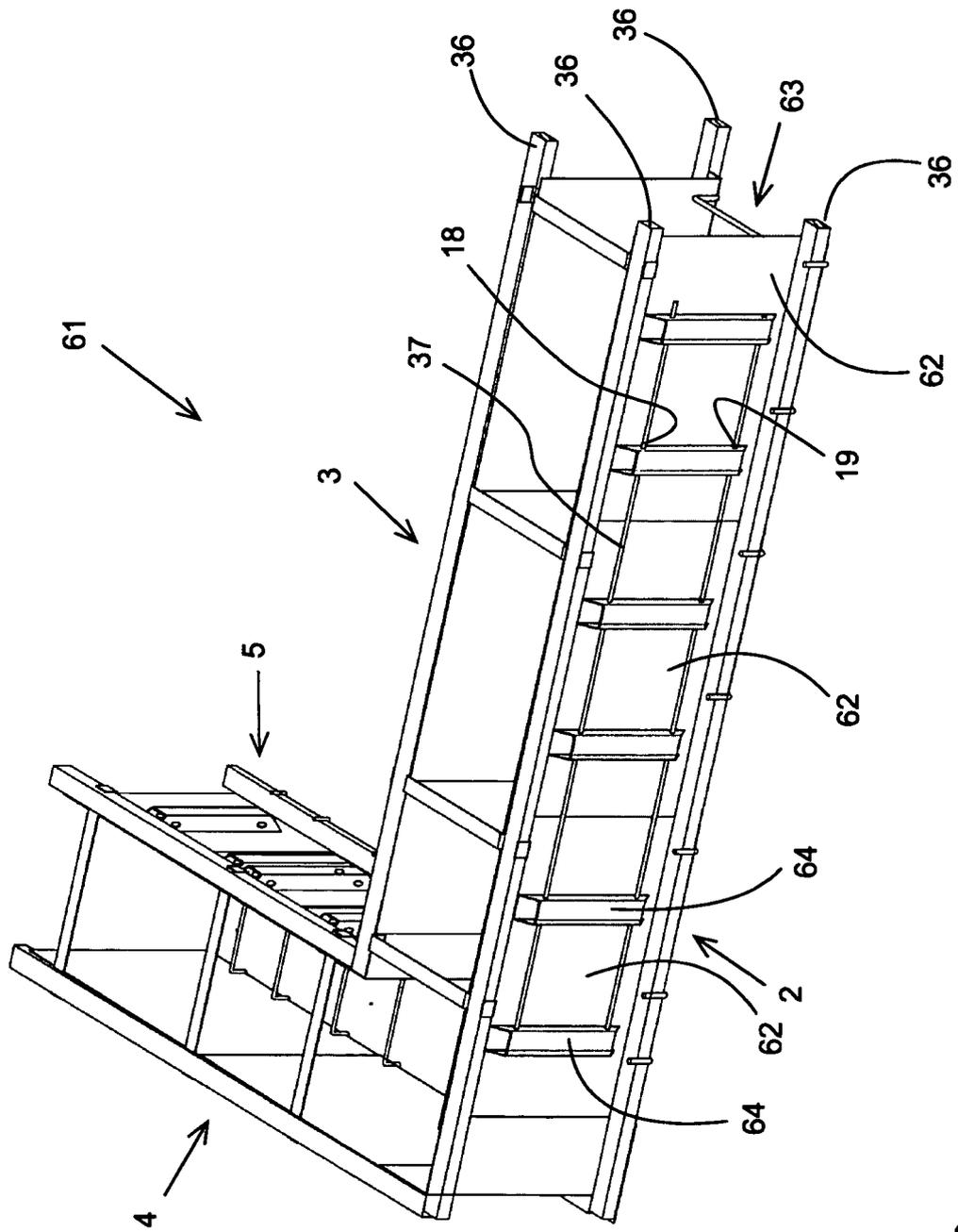


Fig. 12

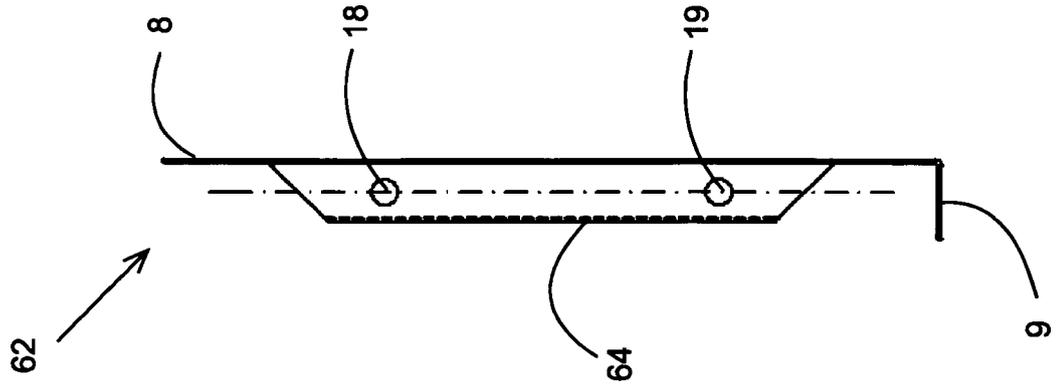


Fig. 13B

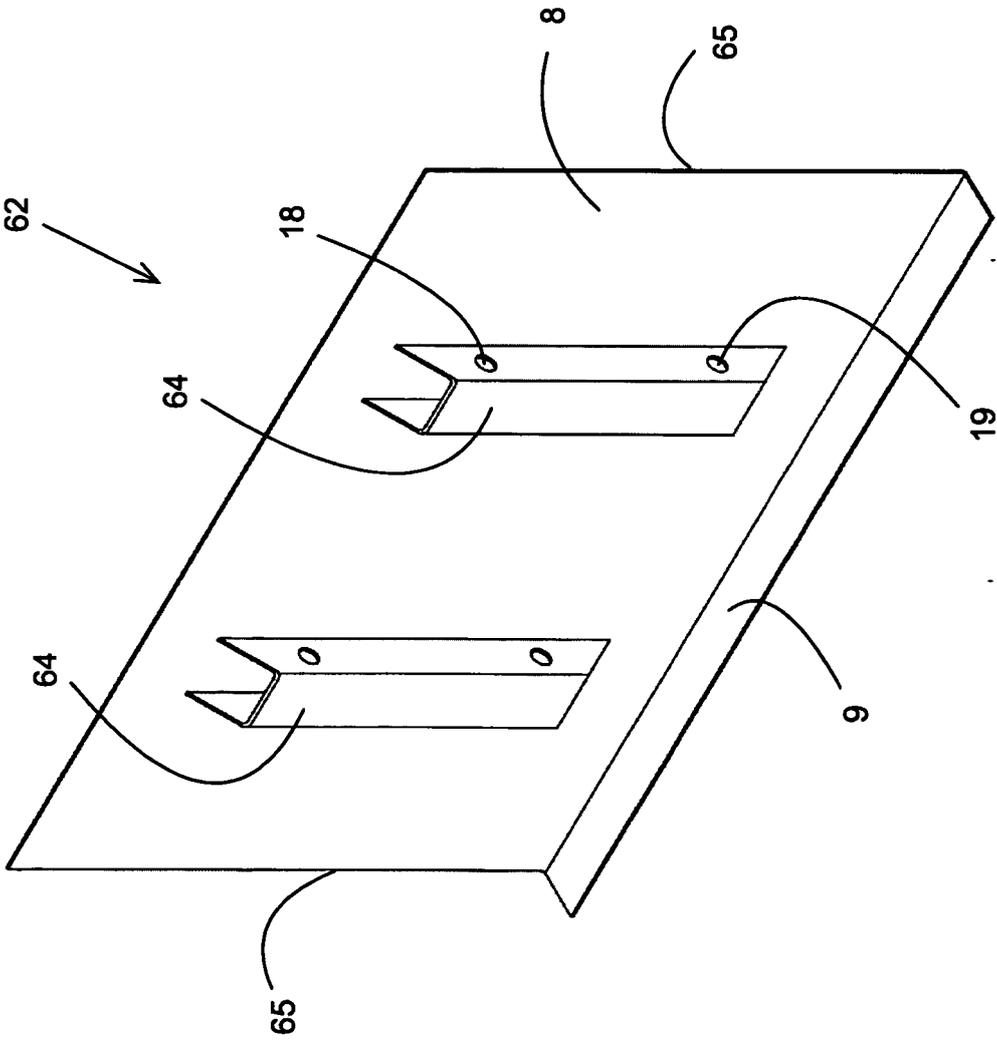


Fig. 13A

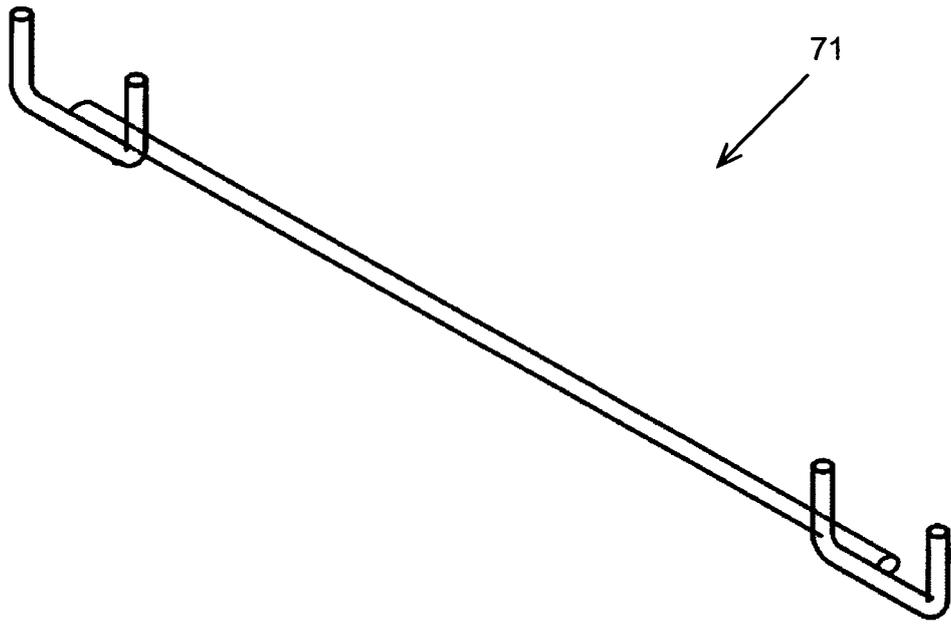


Fig. 14

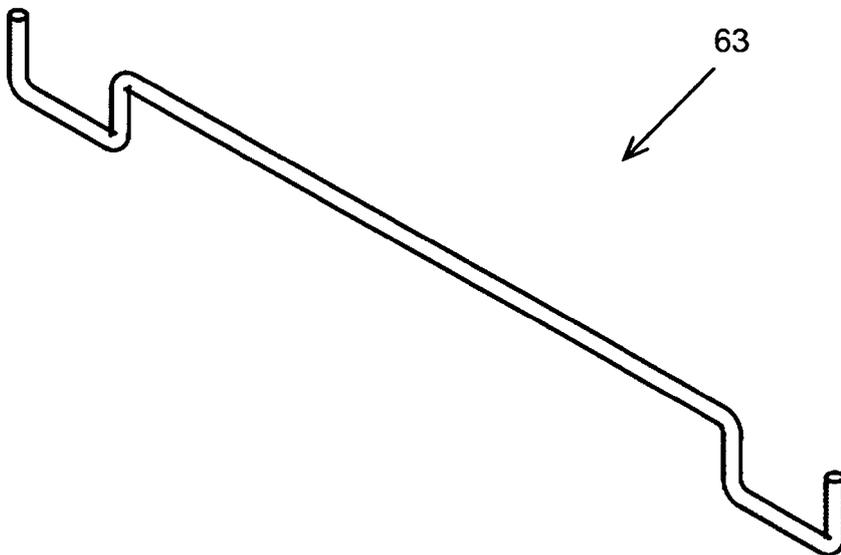


Fig. 16

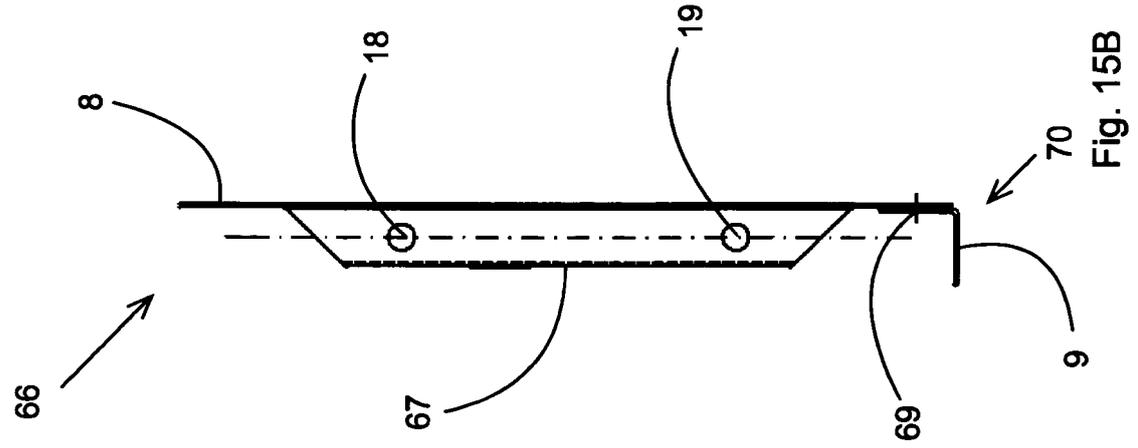


Fig. 15B

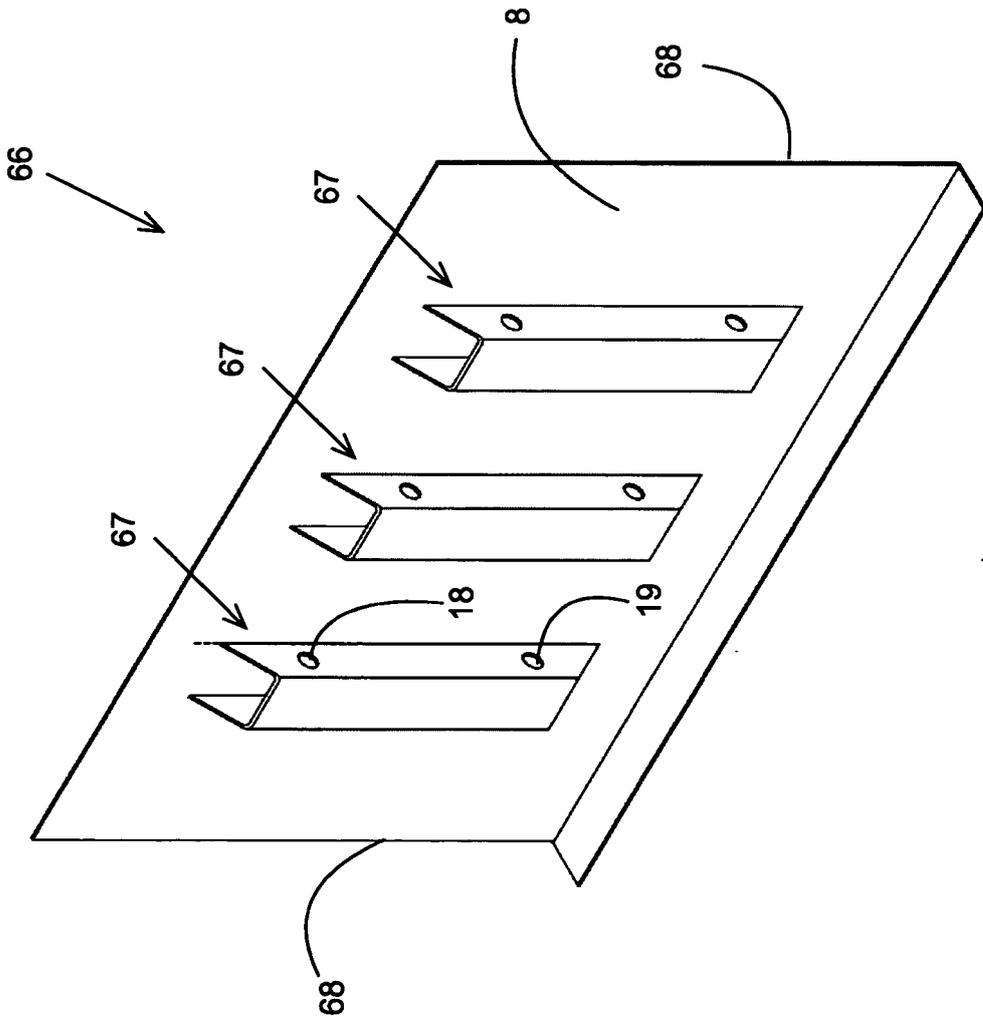


Fig. 15A

REFERENCES CITED IN THE DESCRIPTION

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