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(54) **METHOD AND DEVICE FOR FORMING A LENO FABRIC ON A WEAVING MACHINE**

VERFAHREN UND VORRICHTUNG ZUR HERSTELLUNG EINES DREHERGEWEBES AUF EINER WEBMASCHINE

PROCÉDÉ ET DISPOSITIF DE FABRICATION D UN TISSU DE GAZE SUR UN MÉTIER À TISSER

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Description

[0001] The invention relates to a method and a device for forming a leno fabric on a weaving machine, in which a number of needles are arranged over the width of the weaving machine and are provided with a guide for guiding a warp thread and in which elements provided with a plurality of guides for guiding a warp thread are arranged in order to move a warp thread guided by an element substantially in the longitudinal direction of a needle and transverse thereto.

[0002] A device of this type for weaving a leno fabric is known, inter alia, from DE 466.340. In this case, the needles guiding a warp thread are fixedly attached to a frame of the weaving machine and the elements provided with a plurality of guides for a warp thread are moved up and down as well as to and fro. A device for weaving a leno fabric comprising an aforementioned element is also known from WO 02/04723. With a device of this type, the warp threads guided by the element are alternately moved to the right and to the left of the needles.

[0003] Leno fabrics in which a number of warp threads run continuously and warp threads are alternately woven to the right and to the left of the continuous warp threads and around weft threads are described, inter alia, in FR 702.507. A device of this type is less suitable for weaving at high weaving speeds.

[0004] It is an object of the invention to provide a method and a device which enables a leno fabric to be woven in a simple manner and at high weaving speeds. This object is solved by the method according to claim 1, the device according to claim 11, and the use of a device according to claim 20. Preferred embodiments are defined in the dependent claims.

[0005] To this end, the invention comprises a method in which the warp threads guided by an element form a leno weave with warp threads guided by needles, in which the distance between warp threads at the guides of an element is a multiple of the distance between warp threads at the guides in the needles.

[0006] This allows certain leno fabrics to be formed in a simple manner and at high weaving speeds, more particularly leno fabrics having a specific pattern to be formed.

[0007] According to a preferred embodiment, the guides of the elements are arranged in such a manner that a guide of one needle is arranged substantially opposite one guide of one of the elements. This is possible because the distance between at least two of the guides of an element is a multiple of the distance between the guides of the needles. This allows the number of guides of the elements along the width of the weaving machine to be equal to the number of guides of a needle. In addition, this arrangement also allows for the guides of the elements arranged in succession to be moved substantially in the same plane.

[0008] According to a preferred embodiment, in operation, the guides of the elements arranged in succession are substantially in the same plane. This has the advantage that the elements only have to move up and down over a relatively small distance in order to form a shed with a certain opening than would be the case if they were not in the same plane. Moving the guides in the elements arranged in succession in substantially the same substantially horizontal plane allows weaving at higher weaving speeds.

[0009] According to a simple embodiment, two elements are provided with a plurality of guides, in which the distance between the guides of each element is double the distance between the guides of the needles and in which the guides of each element can be alternately arranged along the width of the weaving machine. The two elements are in this case arranged in succession along the direction of the warp threads. This allows a leno fabric to be formed with a direction of rotation as desired for the successive leno weaves by a suitable transverse movement of the elements. In this case, the two elements can move up and down synchronously and can move to and fro in phase or in counterphase. If the elements move in counterphase and the guides of each element are provided alternately over the width of the weaving machine, an S-weave and a Z-weave are successively formed. If such elements move in phase, in each case an S-weave or a Z-weave is formed.

[0010] According to an embodiment, three elements are provided with a plurality of guides, in which, for example, the distance between the guides of each element is treble the distance between the guides of the needles and in which the guides of each element can be arranged, for example, alternately over the width of the weaving machine. This allows a leno fabric to be formed with a direction of rotation as desired for the successive leno weaves by a suitable transverse movement of the elements. The three elements are in this case arranged in succession along the direction of the warp threads. Analogously, use can be made of four or more elements, in which the distance between the guides of each element is the quadruple or a suitable multiple of the distance between the guides of the needles and in which the guides of each element can be arranged alternately, for example over the width of the weaving machine.

[0011] To this end, the invention comprises a device in which the warp threads guided by an element form a leno weave with warp threads guided by needles, in which the distance between guides of an element is a multiple of the distance between the guides of the needles.

[0012] According to an embodiment, the guides of the elements are arranged such that a guide of a needle can be arranged substantially opposite one guide of one of the elements. According to one embodiment, in operation, the guides of the elements arranged in succession are substantially in the same plane.

[0013] According to a preferred embodiment, the needles are arranged in a fixed position and the elements are arranged such that they can be moved substantially in the longitudinal direction of the needles and transverse thereto. This allows warp threads guided by an element to move up and down as well as to and fro transversely in order to bring said warp thread to a particular side of a needle in order to form a shed with a warp thread guided by the needle.

[0014] According to an embodiment, the device comprises a drive unit in order to move at least one of the elements transversely to and fro, which drive unit comprises a controllable drive motor. This makes it possible, inter alia, to control the transverse movement of an element substantially independently of the vertical movement of the element.

[0015] According to an embodiment, the elements are guided in a lateral guide substantially in the longitudinal direction of the needles and substantially parallel to one another.

[0016] According to a preferred embodiment, the warp threads which are guided by the guides of the needles form the bottom plane of warp threads in the shed. This is advantageous for forming a leno fabric and for providing a drive unit for the elements.

[0017] The invention will be explained in more detail below in order to illustrate the features and further advantages of the invention more clearly with reference to drawings of exemplary embodiments, in which:

fig. 1 diagrammatically shows a weaving machine provided with a device according to the invention;
fig. 2 shows a perspective view of a drive unit of the device according to the invention;
fig. 3 shows a front view of a part of fig. 2;
fig. 4 diagrammatically shows a side view of a device according to fig. 1 in a first position;
fig. 5 diagrammatically shows a front view of a device according to fig. 1 in a specific position;
fig. 6 shows the front view from fig. 5 in a subsequent position;
fig. 7 shows the front view from fig. 6 in a subsequent position;
fig. 8 shows the front view from fig. 7 in a subsequent position;
fig. 9 shows a fabric which can possibly be formed;
fig. 10 shows a variant of the part of fig. 3;
fig. 11 shows a variant of fig. 5;
fig. 12 shows another fabric which can possibly be formed;
fig. 13 shows another variant of fig. 5;
fig. 14 shows an enlarged view of a holder from fig. 1;
fig. 15 shows a variant of fig. 4;
fig. 16 shows a perspective view of part of a device according to the invention;
fig. 17 shows a variant of fig. 16;
fig. 18 shows another variant of fig. 5;
fig. 19 shows another variant of fig. 5;
fig. 20 shows another fabric which can possibly be formed;
fig. 21 shows a variant of fig. 11;
fig. 22 shows part of a device according to the invention.

[0018] The weaving machine illustrated in fig. 1 comprises a device according to the invention, in which a number of needles 1 are arranged at regular intervals over the width of the weaving machine. For the sake of clarity, only a limited number of needles are illustrated, but in the exemplary embodiment shown, needles are provided over the entire width of the fabric to be woven. In each case, a number of needles 1 are attached to a holder 2. Each holder 2 is attached to a transverse beam 5 via an intermediate holder 3 and a plate 4. The transverse beam 5 extends over the entire width of the weaving machine and is fixedly attached to the lateral parts (not shown) of the weaving machine via support pieces 6. The vertical position of the needles 1 may for example be adjusted or set over a certain distance by attaching a holder 2 in a suitable vertical position relative to an intermediate holder 3 or by attaching an intermediate holder 3 in a suitable vertical position relative to a plate 4. To this end, the securing bolts 7 are for example guided with play inside openings of the holder 2 and/or the securing bolts 8 are guided with play inside openings of the intermediate holder 3. The plate 4 may analogously be attached to the transverse beam 5. The weaving machine also comprises a support beam 9 which extends over the width of the weaving machine. The support beam 9 is securely attached for example to the lateral parts (not shown) of the weaving machine and/or to the support pieces 6.

[0019] The weaving machine also comprises two elements 10 and 11 which are provided with a plurality of guides for guiding warp threads. Each element 10 or 11 extends over the width of the weaving machine. The element 10 comprises a lateral support 12 on both sides and a transverse support 13 which connects the two lateral supports 12. Analogously, the element 11 comprises a lateral support 14 on both sides and a transverse support 15 which connects both lateral supports 14. The lateral supports 12 and 14 can be moved up and down with the aid of associated drive rods 16, 17 and 18, 19 substantially along the longitudinal direction of the needles 1. In this case, the drive rods 16 and 17 are moved up and down completely synchronously with one another and the drive rods 18 and 19 are moved up and down completely synchronously with one another by an associated drive (not shown). Such a drive is described, for example, in WO 02/04723 and is, for example, designed with a suitable cam system and with a transmission similar to a conventional drive for weaving frames on a weaving machine. The drive rods 16 to 19 are attached to an associated transverse support 13 or 15 by associated hinges 20. The group of drive rods 16, 17 and the group of drive rods 18, 19 in this case move substantially synchronously with one another. Such drive rods 16 to 19 may be provided at each end of an element 10, 11. With the elements 10, 11, additional drive rods 16 to 19 may engage along the width of the elements 10, 11 between the ends of the elements 10, 11.

[0020] The transverse support 13 also comprises a guide piece 21 which is guided relative to a guide 22 which is fixedly attached to a frame of the weaving machine in order to limit sagging of the transverse support 13 in the direction of the warp threads. The transverse support 15 also comprises a guide piece 23 of this type. The lateral supports 12 and 14 are guided in a pair of lateral guides 24 which is, for example, attached to the support pieces 6. As a result, the element 10 and the element 11 can be guided virtually parallel to one another in a lateral guide 24, so that these can move in a substantially vertical plane, in a plane which is arranged substantially perdendicular to the warp threads or virtually in the longitudinal direction of the needles 1. As illustrated in figs. 2 and 3, the elements 10 and 11 are moved to and fro laterally or transversely by a drive unit 25, in order to be able to move a warp thread guided by an element 10 or 11 transversely relative to the associated needle. In the illustrated embodiment, the transverse support 13 is connected to a coupling rod 26 which is driven by a crank element 27. The crank element 27 is arranged so as to be rotatable about a fixedly arranged rotary shaft 28 which is mounted on a support 29. The support 29 is fixedly arranged on a frame of the weaving machine. A controllable drive motor 30 is also attached to the support 29, for example a controllable switchable reluctance motor. An eccentric 32 is attached to the drive shaft 31 of the drive motor 30, which eccentric 32 is able to drive the crank element 27 in a reciprocating manner via a coupling rod 33. The transverse support 15 is connected in a similar manner to a coupling rod 34 which is driven by the crank element 27. In operation, the coupling rods 26 and 34 are substantially in a horizontal plane. Fig. 3 also shows shaft journals 64, 65 and 66 which respectively connect the lever 27 to a coupling rod 26, 33 or 34 in a rotatable manner.

[0021] The dimensions of the crank element 27 and of the eccentric 32 are chosen such that the elements 10 and 11 can be moved to and fro in the transverse direction at a suitable amplitude. A suitable amplitude is, for example, in the order of magnitude of the distance between the needles. The method by which the length of the coupling rods 26 and 34 can be adjusted is analogous to that described in WO 02/04723 and makes use of adjusting elements 35 or 36 in order to allow the elements 10 and 11 to be adjusted to a desired transverse position, more particularly to a transverse position relative to the needles. The coupling rod 26 is connected via a hinge 37 to the transverse support 13, while the coupling rod 34 is connected to the transverse support 15 via a hinge 38. The transverse support 15 in this case comprises an opening 39 in order to allow a hinge 37 to pass through the transverse support 15.

[0022] As is indicated diagrammatically in figs. 4 to 9, a plane of warp threads 40 is guided through the guides 41 in the needles 1. In the illustrated example, each needle 1 is provided with a guide 41. These warp threads 40 come from a warp beam (not shown) and are guided toward the needles 1, inter alia via a deflecting roller 42. The deflecting roller 42 is attached to the transverse beam 5 by means of springs 43. According to a variant (not shown), the deflecting roller 42 can be securely attached to a transverse beam.

[0023] A plane of warp threads 44 is guided through guides 45 in the element 10, whereas a plane of warp threads 46 is guided through guides 47 in the element 11. In this case, the warp threads 44 and 46 are shown in solid lines in their essentially highest position, whereas those in their essentially lowest position are shown in dashed lines. As illustrated in fig. 1, the guides 45 in the element 10 are provided on holders 48 which are arranged next to one another over the width of the weaving machine and which each comprise a number of guides 45. Analogously, as shown in fig. 1, the guides 47 in the element 11 are provided on holders 49 which are arranged next to one another over the width of the weaving machine and which each comprise a number of guides 47. The elements 10 and 11 are arranged in succession along the direction of the warp. In the example shown, the guides 41, 45 and 47 consist of thread guides in the shape of guiding eyelets.

[0024] The warp threads 40 and 44 or the warp threads 40 and 46, which together are intended to form a leno weave, are in each case guided in a known manner between two reed teeth of a reed 50. The reed 50 is mounted on a beater in a known manner. The warp threads 40 and 44 and the warp threads 40 and 46 may form a shed 51, in which the bottom plane of warp threads of the shed 51 is formed by the warp threads 40 which are guided through the fixedly arranged needles 1, and the top plane of warp threads is formed by the warp threads 44 and 46 which are guided through an element 10 or 11.

[0025] Fig. 5 shows the position of the elements 10 and 11 and of the needles 1 with respect to one another in a first position for a device as illustrated in figs. 1 to 4. The guides of the elements 10 and 11 are arranged such that a guide 41 of a needle 1 is arranged substantially opposite or near a guide 45 or 46 of one of the elements 10 or 11. In this case, the number of guides 45, 47 of elements 10 and 11 provided along the width of the weaving machine is equal to the number of guides 41 of needles 1. The distance X between the guides 45 of the element 10 is in this case equal to the distance Y between the guides 47 of the element 11, whereas these distances X and Y are double, that is to say twice, the distance Z between the guides 41 of the needles 1. The element 10 is in this case arranged such that the warp threads 44 are to the right of the associated needles 1, whereas the element 11 is in this case arranged such that the warp threads 46 are to the left of the associated needles. Subsequently, the elements 10 and 11 are moved up together whereas the needles remain stationary, thus resulting in the position shown in fig. 6. In this position, a weft thread can be introduced. In the meantime, the element 10 moves to the left and the element 11 moves to the right, and both together are being moved downward to the position shown in fig. 7. Then, the elements 10 and 11 move back up to the position shown in fig. 8. In this position, a subsequent weft thread can be introduced. In the meantime, the elements 10 and 11 move to the right and left, respectively, and both together move downward back to the position shown in fig. 5. Then the successive positions of figs. 5 to 8 are repeated, in which each warp thread 44 or 46 guided by an element 10 or 11 moves substantially in the longitudinal direction of a needle 1 and transverse thereto. In this way, a fabric can be produced as illustrated in fig. 9, in which warp threads 40, 44, 46 and weft threads 67 form a fabric.

[0026] It will be clear that the movement of the elements 10, 11 in the longitudinal direction of the needles 1 and the movement of these elements 10, 11 transversely to the needles 1 can partly take place simultaneously, despite the fact that both movements are driven separately. It will be clear that the elements 10 and 11 are in this case moved transversely in counterphase.

[0027] As is illustrated in more detail in figs. 5 to 8, the two elements 10 and 11 are provided with a plurality of guides 45 or 47, the distance between the guides 45 or 47 of each element 10, 11 being double the distance between the guides 41 of the needles 1. The guides 45 and 47 are in this case arranged alternately along the width of the weaving machine, which means that a guide 45 and a guide 47 are arranged in succession. In operation, the guides 45 and 47 in the elements 10, 11 arranged in succession are in substantially the same plane, more particularly in a substantially horizontal plane.

[0028] As can be seen in fig. 3, the length B of the crank arm of the crank element 27 by which the element 11 is moved via the coupling rod 34 is slightly larger than the length A of the crank arm of the crank element 27 with which the element 10 is controlled via the coupling rod 26. This allows the element 11 which is located further from the beat-up line 52 of the fabric 53 to move relatively more transversely than the element 10 which is closer to the beat-up line 52 of the fabric 53. Consequently, it is ensured that the warp threads 46 are moved transversely over such a distance that the warp threads 46 can substantially form the same angle to the warp direction as the warp threads 44. This is advantageous in order to move the warp threads 44 and 46 to the desired side of the needles 1.

[0029] If, as indicated in fig. 10, the coupling rods 26 and 34 are provided on the same crank arm of the crank element 27, the device according to the invention can be used to form a leno weave in a manner analogously to that described in WO 02/04723. In this case, the coupling rod 26 is attached using a shaft journal 68. If the coupling rod 26 in the embodiment of fig. 10 were attached at the shaft journal 64, as indicated by a dashed line, a device similar to that of fig. 3 would result.

[0030] Fig. 11 shows a position of the elements 10 and 11 which is analogous to the position in fig. 5. With this embodiment, both elements 10 and 11 can, for example with the aid of a device as shown in fig. 10, be moved together to the left or to the right, albeit on a slightly different course. In this manner, a fabric can be produced as illustrated in fig. 12, in which warp threads 40, 44 , 46 and weft threads 67 form a fabric. It will be clear that in this case the elements 10 and 11 are moved transversely in phase.

[0031] Analogously to fig. 5, fig. 13 shows an embodiment in which three elements 10, 11 and 54 are provided with a plurality of guides 45, 47 and 55, in which the distance between the guides 45, 47 or 55 of each element 10, 11 or 54 is treble the distance between the guides 41 of the needles 1. In this case, the guides 45, 47 or 55 of each element 10, 11 or 54 are arranged alternately along the width of the weaving machine. Each element 10, 11 or 54 may, for example, be driven by a dedicated drive motor in accordance with a desired pattern in order to be able to form a specific leno weave. Each element 10, 11 and 54 can guide a plane of associated warp threads 44, 46 and 56.

[0032] A specific holder 48, as illustrated in fig. 1, is shown on an enlarged scale in fig. 14. Providing holders 48, 49 with a limited number of guides 45, 47, means that when one of the guides 45, 47 breaks or becomes damaged, only one holder 48, 49 with a limited number of guides has to be replaced.

[0033] Although it is advantageous for the needles 1 to be fixedly arranged and for the elements 10, 11 to be arranged so as to be movable substantially in the longitudinal direction of the needles 1 and transverse thereto, the needles can also be arranged so as to be upwardly and downwardly movable. This allows, for example, the course of the elements 10, 11 along the longitudinal direction of the needles 1 to be limited from the top position to approximately half the course illustrated in fig. 4. In fig. 4, the course is determined by the opening of the shed 51. In this case, the needles 1 have to move upward approximately halfway along the abovementioned course, so that a warp thread 44 or 46 can be moved to the other side of an associated needle 1 at the point in time when the warp threads 44 or 46 are under the ends of the needles 1.

[0034] It is advantageous if the warp threads 40 which are guided by the guides 41 of the needles 1 form the bottom plane of warp threads of the shed 51. According to a variant shown in fig. 15, the warp threads 40 which are guided through the needles 1 may of course form the top plane of warp threads of the shed 51. In this case, the needles 1 have to point upward. The elements 10 and 11 may, for example, remain arranged analogously, whereas the warp threads 44 and 46 in this case obviously have to move to the top position relative to the needles 1 transversely to the other side of the needles 1. The terms top and bottom in the description are thus relative terms which are associated with a specific embodiment.

[0035] Fig. 16 shows a variant in which the elements

10 and 11 each comprise an elongate support element 57, 58 which is provided with guides 45 and 47, respectively , for guiding a warp thread 44 or 46. This elongate support element 57, 58 can be attached to a transverse support 13 or 15 in a manner analogous to a holder 48, 49. The needles 1 are arranged analogously to fig. 1.

[0036] Fig. 17 shows another variant in which each of the elements 10 and 11 comprises an elongate support element 59, 60 which is respectively provided with guides 45 and 47 for guiding a warp thread 44 or 46. Each elongate support element 59, 60 is also provided respectively with a relatively large opening 61, 62 which allows a warp thread 46 or 44 to pass through the elongate support element 59, 60. The latter is advantageous in order to keep the warp threads 44 and 46 at the guides 45 and 47 separate.

[0037] Fig. 18 shows another variant in which the distance between guides 45, 47 of at least one element 10, 11 is a multiple of the distance between guides 41 of the needles 1. In this case, the distance between at least two of the guides 45 of the element 10 is a multiple of the distance between the guides 41 of the needles 1. In this embodiment, the distance between the guides 47 of the element 11 is in each case a multiple of the distance between the needles 1. Obviously, other such variants are also possible which allow certain specific leno weaves to be formed.

[0038] According to a variant (not shown), use can be made of four or more elements according to the invention, in which the distance between the guides of each element can be a suitable multiple of the distance between the guides of the needles and in which the guides of each element are arranged according to a specific pattern along the width of the weaving machine. In this case, a multiple is understood to mean double, treble, quadruple, quintuple or any other multiple.

[0039] The use of holders 48 and 49 allows the application of a transverse support 13 or 15 which is in each case located outside the shed 51. This allows the use of a selvage device 63 which, together with a device according to the invention, can form a fabric. The warp threads which are controlled by the selvedge device 63 are in this case essentially unimpeded by the transverse supports 13 and 15. The selvage device 63 may be designed, for example, as illustrated in EP 772.703 B1.

[0040] According to a variant (not shown), the transverse movement of the elements 10 and 11 may, for example, be produced with the aid of at least one linear drive motor rather than with the aid of a drive motor 30, an eccentric 32, a crank element 27 and the like. According to a variant (not shown), each element can be driven by a dedicated controllable drive motor. Of course, it is also possible to derive this transverse movement from another drive shaft of the weaving machine, for example via a system of cams or a system of rods which is, for example, driven by a drive shaft which is connected to and rotates synchronously with the drive shaft of the sley.

[0041] Although in each case only one warp thread is guided by a specific guide in the examples shown, it will be clear that two or more warp threads can be guided together by a specific guide. It is likewise possible to replace such a guide by two or more guides which are arranged in close proximity to one another and which in each case guide at least one warp thread. This allows special leno fabrics to be formed.

[0042] Although it is preferable to arrange the needles uniformly over the width of the weaving machine and to arrange guides of one of the elements substantially opposite the needles, the needles and the associated guides of the elements can also be arranged at varying distances along the width of the weaving machine. This allows, for example, special leno fabrics to be formed.

[0043] Although any type of warp thread can be used with a device according to the invention, the device according to the invention is particularly suitable for weaving relatively thick warp threads 40 under high tension together with relatively thin warp threads 44 or 46 under lower tension, so that these relatively thin warp threads 44, 46 can be woven around the relatively thick warp threads 40. This results in a leno fabric in which the relatively thick warp threads 40 remain substantially stretched and are not tied around or about weft threads.

[0044] In case an element 10, 11 or 54 is not moved transversely to the left or to the right after every insertion of a weft thread, but is only moved sufficiently transversely after a number of insertions, a special leno fabric can be formed having a leno weave with a group of weft threads. Of course, each element 10, 11 or 54 does not have to be returned from the top vertical position via the bottom vertical position to the top vertical position during each insertion, but this movement can be carried out after only a number of insertions. Of course, combinations of previous movements are possible. However, it is preferable to form a leno fabric in which the elements 10, 11, 54 are transversely moved to or fro during each insertion, and in which the elements 10, 11, 54 execute the abovementioned upward and downward movement between each insertion, as this produces a well-woven leno fabric.

[0045] As described in fig. 19, a device according to the invention can also be used in combination with another device for forming leno weaves. In this case, an element 69 is for example provided which has guides 70 for guiding warp threads 71, in which the distance between the guides 70 is equal to the distance between the guides 41 of the needles 1. The frame-shaped element 69 has an opening 72 which allows warp threads 44, 46 to pass through this element 69. The element 69 can be moved transversely to and fro as well as up and down by means of a drive unit in a manner analogous to that of the elements 10, 11. If, for example, the elements 10 and 11 together are moved transversely and in phase and the element 69 is moved in counterphase to the elements 10, 11, a fabric can be formed as illustrated in fig. 20, in which warp threads 44, 46 and 71 together with weft threads 67 form a fabric.

[0046] Fig. 21 shows another variant in which, in addition to the elements 10 and 11, elements 73 and 74 are also provided according to the invention. The element 73 comprises guides 75 for warp threads 76, whereas the element 74 comprises guides 77 for warp threads 78. The elements 73 and 74 are in this case designed in the shape of a frame and comprise an opening 79 or 80 in order to pass the warp threads 44 and 46 through the elements 73 and 74. The elements 73 and 74 may be driven in a manner similar to that of the elements 10 and 11. By means of such a device, it is also possible to weave a leno fabric as illustrated in fig. 20.

[0047] Fig. 22 shows a variant, in which the elements 10, 11 which comprise guides 45, 47 for guiding warp threads 44, 46 are arranged one above the other. The element 10 in this case comprises a plurality of openings 81 for passing warp threads 46 through. Such elements 10, 11 can be arranged opposite needles in a suitable manner and can be used in a manner analogous to that of the embodiment of fig. 5 in order to manufacture a leno fabric according to the invention.

[0048] It will be clear that the device according to the invention can also be replaced by a device as disclosed in WO 02/04723 or by a device as disclosed in DE 466.340. This makes it possible, for example, to modify a weaving machine comprising a device according to the invention to form a weaving machine according to the state of the art and subsequently to form certain known fabrics. It is, for example, also possible to replace at least one element 10 or 11 with an element according to the state of the art, in which the distance between the guides of this element is equal to the distance between the guides of the needles. If use is made of two of the above-mentioned elements, which are, for example, moved transversely and in counterphase for each insertion, a leno fabric can be formed in which the warp threads 40 are in each case tied in on both sides by a warp thread from a first element and by a warp thread from a second element.

[0049] It will be clear that the invention may be used on any type of weaving machine, such as an air weaving machine, a gripper weaving machine, a water jet weaving machine, a projectile weaving machine, a gripper shuttle weaving machine or another type of weaving machine. The device according to the invention also has the advantage that it can be fitted on practically any existing weaving machine in a simple manner.

[0050] A method and a device according to the invention inter alia allow a leno fabric to be formed having both leno weaves with an S-weave and leno weaves with a Z-weave which are woven next to one another, both alternately as well as according to a specific pattern.

[0051] A method according to the invention in which the distance between the warp threads 44, 46 which are guided in guides 45, 47 of an element 10, 11 is a multiple of the distance between the warp threads 40 which are guided in guides 41 of the needles 1 is preferably used with the aid of a device according to the invention.

[0052] It will be clear that a leno fabric does not have to be formed over the entire width of the weaving machine. According to one option, it is for example possible to remove certain holders 48 or 49 and needles arranged opposite these holders 48, 49 such that a conventional fabric can be woven in that area, more particularly a conventional plane fabric. The warp threads of this conventional fabric can be controlled in a known manner by frames, harness cords of a jacquard device or in any other manner. The expression over the width of the weaving machine in the description of this application is understood to mean over at least a part of the entire width of the weaving machine.

[0053] It will be clear that if the elements 10, 11, 54 are not moved to or fro transversely during a number of successive insertions of weft threads, a conventional fabric can be woven with a device according to the invention, more particularly a conventional one-one fabric. If one of the elements is not moved transversely to and fro and another element is moved transversely to and fro, a fabric can be formed which has both a leno weave and a conventional fabric weave. Obviously, other combinations are also possible.

[0054] The method and device according to the invention are of course not limited to the embodiments described by way of example and illustrated in the figures, but can be designed according to different variants and combinations of the illustrated embodiments without departing from the scope of the invention.

Claims

1. A method for forming sheds for the production of leno fabrics (53) by using a plurality of needles (1) which guide a plurality of warp threads (40) and by using at least one element (10, 11, 54, 73, 74) which guides a plurality of warp threads (44, 46, 56, 76, 78) and which moves the plurality of warp threads (44, 46, 56, 76, 78) along the needles (1) and in transverse direction transverse to the needles (1), **characterized in that** the at least one element (10, 11, 54, 73, 74) guides the plurality of warp threads (44, 46, 56, 76, 78) at distances in the transverse direction which are a multiple of the distances in which the warp threads (40) are guided by the needles (1).

2. The method according to claim 1, **characterized in that** two or more elements (10, 11, 54, 73, 74), which each guide a plurality of warp threads (44, 46, 56, 76, 78), are arranged in succession of which at least one element guides the warp threads in distances which are a multiple of the equal distances in which the warp threads (40) are guided by the needles (1).

3. The method as claimed in one of the claims 1 or 2, **characterized in that** guides (45, 47, 55, 75, 77) of the elements (10, 11, 54, 73, 74) are arranged in

such a manner that one guide (41) of one needle (1) is arranged substantially opposite one guide (45, 47, 55, 75, 77) of one of the elements (10, 11, 54, 73, 74).

4. The method as claimed in claim 3, **characterized in that** the distance between at least two of the guides (45, 47, 55, 75, 77) of an element (10, 11, 54, 73, 74) is a multiple of the distance between the guides (41) of the needles (1).

5. The method according to claims 3 to 4, **characterized in that** the number of guides (45, 47, 55, 75, 77) in the elements (10, 11, 54, 73, 74) along the width of the weaving machine is equal to the number of guides (41) of the needles (1).

6. The method as claimed in one of claims 1 to 5, **characterized in that** the elements (10, 11, 54, 73, 74) are arranged in succession along the warp direction.

7. The method as claimed in claim 6, **characterized in that**, in operation, the guides (45, 47, 55, 75, 77) of the elements (10, 11, 54, 73, 74) arranged in succession are substantially in the same plane.

8. The method as claimed in one of claims 1 to 7, **characterized in that** two elements (10, 11) are provided with a plurality of guides (45, 47), in which the distance between the guides (45, 47) of each element (10, 11) is double the distance between guides (41) of the needles (1) and in which the guides (45, 47) of each element (10, 11) are alternately arranged along the width of the weaving machine.

9. The method as claimed in one of claims 1 to 8, **characterized in that** three elements (10, 11, 54, 73, 74) are provided with a plurality of guides (45, 47, 55, 75, 77), in which the distance between the guides (45, 47, 55, 75, 77) of each element (10, 11, 54, 73, 74) is treble the distance between guides (41) of the needles (1) and in which the guides (45, 47, 55, 75, 77) of each element (10, 11, 54, 73, 74) are arranged alternately over the width of the weaving machine.

10. The method for forming sheds for the production of leno fabrics (53) as claimed in one of claims 1 to 9 used for forming a leno fabric (53) on a weaving machine, wherein the needles (1) of the plurality of needles (1) are arranged over the width of the weaving machine and are each provided with a guide (41) for guiding a warp thread (40), wherein the at least one element (10, 11, 54, 73, 74), which moves the plurality of warp threads (44, 46, 56, 76, 78) along the needles (1) and transverse to the needles (1), is provided with a plurality of guides (45, 47, 55, 75, 77) for guiding a warp thread (44, 46, 56, 76, 78), and wherein the method further comprises forming leno weaves with warp threads (44, 46, 56, 76, 78) guided by the at least one element (10, 11, 54, 73, 74) and warp threads (41) guided by needles (1).

11. A device for forming sheds for the production of leno fabrics (53) having a plurality of needles (1) each provided with a guide (41) for guiding a warp thread (40) and at least one element (10, 11, 54, 73, 74) provided with a plurality of guides (45, 47, 55, 75) for guiding a warp thread (44, 46, 56, 76, 78) which element is movable to move the warp threads (44, 46, 56, 76, 78) guided by it along the needles and in transverse direction transverse to the needles, **characterized in that** the guides (45, 47, 55, 75) of the at least one element (10, 11, 54, 73, 74) are arranged in the transverse direction in distances which are a multiple of the distances in which the guides (41) of the needles (1) are located.

12. The device according to claim 11, **characterized in that** two or more elements (10, 11, 54, 73, 74) are provided in succession of which at least one element is provided with guides (45, 47, 55, 75, 77) in distances which are a multiple of the equal distances in which the guides (41) of the needles (1) are located.

13. The device as claimed in one of the claims 11 to 12, **characterized in that** the guides (45, 47, 55, 75, 77) of the elements (10, 11, 54, 73, 74) are arranged in such a manner that a guide (41) of a needle (1) is arrangeable substantially opposite one guide (45, 47, 55, 75, 77) of one of the elements (10, 11, 54, 73, 74).

14. The device as claimed in one of claims 11 to 13, **characterized in that** the elements (10, 11, 54, 73, 74) are arranged in succession along the warp direction.

15. The device as claimed in one of claims 11 to 14, **characterized in that**, in operation, the guides (45, 47, 55, 75, 77) of the elements (10, 11, 54, 73, 74) arranged in succession are substantially in the same plane.

16. The device as claimed in one of claims 11 to 15, **characterized in that** the needles (1) are arranged in a fixed position and the elements (10, 11, 54, 73, 74) are arranged such that they can be moved substantially in the longitudinal direction of the needles (1) and transverse thereto.

17. The device as claimed in one of claims 11 to 16, **characterized in that** the device comprises a drive unit (25) in order to move at least one of the elements (10, 11, 54, 73, 74) transversely to and fro, which drive unit (25) comprises at least one controllable drive motor (30).

18. The device as claimed in one of claims 11 to 17, **characterized in that** the elements (10, 11, 54, 73, 74) are guided in a lateral guide (24) substantially in the longitudinal direction of the needles (1) and substantially parallel to one another.

19. The device as claimed in one of claims 11 to 18, **characterized in that** the warp threads (40) which are guided by the guides (41) of the needles (1) form the bottom plane of warp threads in the shed (51).

20. Use of a device for forming sheds as claimed in one of claims 11 to 19 for forming a leno fabric (53) on a weaving machine, wherein the needles (1) of the plurality of needles (1) are arranged over the width of the weaving machine.

Patentansprüche

1. Ein Verfahren zum Bilden von Webfächern zur Herstellung von Drehergeweben (53) mittels einer Vielzahl von Nadeln (1), die eine Vielzahl von Kettfäden (40) führen, und mittels mindestens eines Elements (10, 11, 54, 73, 74), das eine Vielzahl von Kettfäden (44, 46, 56, 76, 78) führt, und das die Vielzahl von Kettfäden (44, 46, 56, 76, 78) entlang der Nadeln (1) und in Querrichtung quer zu den Nadeln (1) bewegt, **dadurch gekennzeichnet, dass** das mindestens eine Element (10, 11, 54, 73, 74) die Vielzahl von Kettfäden (44, 46, 56, 76, 78) in Abständen in Querrichtung führt, die ein Mehrfaches von den Abständen sind, in denen die Kettfäden (40) durch die Nadeln (1) geführt werden.

2. Das Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** zwei oder mehr Elemente (10, 11, 54, 73, 74), die jeweils eine Vielzahl von Kettfäden (44, 46, 56, 76, 78) führen, nacheinander angeordnet sind, wobei mindestens ein Element die Kettfäden in Abständen führt, die ein Mehrfaches der gleichen Abstände sind, in denen die Kettfäden (40) durch die Nadeln (1) geführt werden.

3. Das Verfahren nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** Führungen (45, 47, 55, 75, 77) der Elemente (10, 11, 54, 73, 74) so angeordnet sind, dass eine Führung (41) einer Nadel (1) im Wesentlichen gegenüber einer Führung (45, 47, 55, 75, 77) eines der Elemente (10, 11, 54, 73, 74) angeordnet ist.

4. Das Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** der Abstand zwischen mindestens zwei der Führungen (45,47,55,75,77) eines Elements (10, 11, 54, 73, 74) ein Mehrfaches von dem Abstand zwischen den Führungen (41) der Nadeln (1) ist.

5. Das Verfahren nach Ansprüchen 3 bis 4, **dadurch gekennzeichnet, dass** die Anzahl der Führungen (45, 47, 55, 75, 77) in den Elementen (10, 11, 54, 73, 74) entlang der Breite der Webmaschine gleich der Anzahl der Führungen (41) der Nadeln (1) ist.

6. Das Verfahren nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Elemente (10, 11, 54, 73, 74) nacheinander entlang der Kettrichtung angeordnet sind.

7. Das Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** in Betrieb, die Führungen (45,47,55,75,77) der nacheinander angeordneten Elemente (10, 11, 54, 73, 74) im Wesentlichen in der gleichen Ebene liegen.

8. Das Verfahren nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** zwei Elemente (10, 11) mit einer Vielzahl von Führungen (45, 47) versehen sind, wobei der Abstand zwischen den Führungen (45, 47) jedes Elements (10, 11) das Zweifache des Abstands zwischen Führungen (41) der Nadeln (1) ist, und wobei die Führungen (45, 47) jedes Elements (10, 11) abwechselnd entlang der Breite der Webmaschine angeordnet sind.

9. Das Verfahren nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** drei Elemente (10, 11, 54, 73, 74) mit einer Vielzahl von Führungen (45, 47, 55, 75, 77) versehen sind, wobei der Abstand zwischen den Führungen (45, 47, 55, 75, 77) jedes Elements (10, 11, 54, 73, 74) das Dreifache des Abstands zwischen Führungen (41) der Nadeln (1) ist, und wobei die Führungen (45,47,55,75,77) jedes Elements (10, 11, 54, 73, 74) abwechselnd über die Breite der Webmaschine angeordnet sind.

10. Das Verfahren zum Bilden von Webfächern zur Herstellung von Drehergeweben (53) nach einem der Ansprüche 1 bis 9, verwendet zum Bilden eines Drehergewebes (53) auf einer Webmaschine, wobei die Nadeln (1) der Vielzahl von Nadeln (1) über die Breite der Webmaschine angeordnet sind und jeweils mit einer Führung (41) zum Führen eines Kettfadens (40) versehen sind, wobei das mindestens eine Element (10, 11, 54, 73, 74), das die Vielzahl von Kettfäden (44, 46, 56, 76, 78) entlang der Nadeln (1) und quer zu den Nadeln (1) bewegt, mit einer Vielzahl von Führungen (45, 47, 55, 75, 77) zum Führen eines Kettfadens (44, 46, 56, 76, 78) versehen ist, und wobei das Verfahren weiter das Bilden von Dreherbindungen mit Kettfäden (44, 46, 56, 76, 78), die durch das mindestens eine Element (10, 11, 54, 73, 74) geführt werden, und Kettfäden (41) die durch Nadeln (1) geführt werden, umfasst.

11. Eine Vorrichtung zum Bilden von Webfächern zur

Herstellung von Drehergeweben (53) mit einer Vielzahl von Nadeln (1), die jeweils mit einer Führung (41) zum Führen eines Kettfadens (40) versehen sind, und mindestens einem Element (10, 11, 54, 73, 74), das mit einer Vielzahl von Führungen (45, 47, 55, 75) zum Führen eines Kettfadens (44, 46, 56, 76, 78) versehen ist, welches Element bewegbar ist, um die von ihm geführten Kettfäden (44, 46, 56, 76, 78) entlang der Nadeln und in Querrichtung quer zu den Nadeln zu bewegen, **dadurch gekennzeichnet, dass** die Führungen (45, 47, 55, 75) des mindestens einen Elements (10, 11, 54, 73, 74) in der Querrichtung in Abständen angeordnet sind, die ein Mehrfaches von den Abständen sind, in denen die Führungen (41) der Nadeln (1) liegen.

12. Die Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** zwei oder mehr Elemente (10, 11, 54, 73, 74) nacheinander vorgesehen sind, wobei mindestens ein Element in Abständen, die ein Mehrfaches von den gleichen Abständen sind, mit Führungen (45, 47, 55, 75, 77) versehen ist, in denen die Führungen (41) der Nadeln (1) liegen.

13. Die Vorrichtung nach einem der Ansprüche 11 bis 12, **dadurch gekennzeichnet, dass** die Führungen (45, 47, 55, 75, 77) der Elemente (10, 11, 54, 73, 74) so angeordnet sind, dass eine Führung (41) einer Nadel (1) im Wesentlichen gegenüber einer Führung (45,47,55,75,77) eines der Elemente (10,11,54,73,74) angeordnet werden kann.

14. Die Vorrichtung nach einem der Ansprüche 11 bis 13, **dadurch gekennzeichnet, dass** die Elemente (10, 11, 54, 73, 74) nacheinander entlang der Kettrichtung angeordnet sind.

15. Die Vorrichtung nach einem der Ansprüche 11 bis 14, **dadurch gekennzeichnet, dass** in Betrieb, die Führungen (45, 47, 55, 75, 77) der nacheinander angeordneten Elemente (10, 11, 54, 73, 74) im Wesentlichen in dergleichen Ebene liegen.

16. Die Vorrichtung nach einem der Ansprüche 11 bis 15, **dadurch gekennzeichnet, dass** die Nadeln (1) in einer festen Position angeordnet sind und die Elemente (10, 11, 54, 73, 74) so angeordnet sind, dass sie im Wesentlichen in der Längsrichtung der Nadeln (1) und quer dazu bewegt werden können.

17. Die Vorrichtung nach einem der Ansprüche 11 bis 16, **dadurch gekennzeichnet, dass** die Vorrichtung eine Antriebseinheit (25) enthält, um mindestens eines der Elemente (10,11,54,73,74) quer hin und her zu bewegen, welche Antriebseinheit (25) mindestens einen steuerbaren Antriebsmotor (30) enthält.

18. Die Vorrichtung nach einem der Ansprüche 11 bis 17, **dadurch gekennzeichnet, dass** die Elemente (10, 11, 54, 73, 74) in einer Seitenführung (24) im Wesentlichen in der Längsrichtung der Nadeln (1) und im Wesentlichen parallel zueinander geführt werden.

19. Die Vorrichtung nach einem der Ansprüche 11 bis 18, **dadurch gekennzeichnet, dass** die Kettfäden (40), die durch die Führungen (41) der Nadeln (1) geführt werden, die untere Ebene der Kettfäden im Webfach (51) bilden.

20. Verwendung einer Vorrichtung zum Bilden von Webfächern nach einem der Ansprüche 11 bis 19 zum Bilden eines Drehergewebes (53) auf einer Webmaschine, wobei die Nadeln (1) der Vielzahl von Nadeln (1) über die Breite der Webmaschine angeordnet sind.

Revendications

1. Un procédé pour former des foules pour la fabrication des tissus de gaze (53) en utilisant une pluralité d'aiguilles (1) qui guident une pluralité de fils de chaîne (40) et en utilisant au moins un élément (10, 11, 54, 73, 74) qui guide une pluralité de fils de chaîne (44, 46, 56, 76, 78) et qui déplace la pluralité de fils de chaîne (44, 46, 56, 76, 78) le long des aiguilles (1) et en direction transversale transversalement aux aiguilles (1), **caractérisé en ce que** le au moins un élément (10, 11, 54, 73, 74) guide la pluralité de fils de chaîne (44, 46, 56, 76, 78) à des distances dans la direction transversale qui sont un multiple de distances dans lesquelles les fils de chaîne (40) sont guidés par les aiguilles (1).

2. Le procédé selon la revendication 1, **caractérisé en ce que** deux ou plusieurs éléments (10, 11, 54, 73, 74), qui guident chacun une pluralité de fils de chaîne (44, 46, 56, 76, 78), sont disposés successivement dont au moins un élément guide les fils de chaîne dans les distances qui sont un multiple de distances égales dans lesquelles les fils de chaîne (40) sont guidés par les aiguilles (1).

3. Le procédé selon l'une quelconque des revendications 1 ou 2, **caractérisé en ce que** guides (45, 47, 55, 75, 77) des éléments (10, 11, 54, 73, 74) sont disposés de telle sorte qu'un guide (41) d'une aiguille (1) est disposé sensiblement en face d'un guide (45, 47, 55, 75, 77) de l'un des éléments (10, 11, 54, 73, 74).

4. Le procédé selon la revendication 3, **caractérisé en ce que** la distance entre au moins deux des guides (45, 47, 55, 75, 77) d'un élément (10, 11, 54, 73, 74) est un multiple de la distance entre les guides (41) des aiguilles (1).

5. Le procédé selon les revendications 3 à 4, **caractérisé en ce que** le nombre de guides (45, 47, 55, 75, 77) dans les éléments (10, 11, 54, 73, 74) le long de la largeur de la machine à tisser est égal au nombre de guides (41) des aiguilles (1).

6. Le procédé selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** les éléments (10, 11, 54, 73, 74) sont disposés successivement le long de la direction de chaîne.

7. Le procédé selon la revendication 6, **caractérisé en ce qu'**en fonctionnement, les guides (45, 47, 55, 75, 77) des éléments (10, 11, 54, 73, 74) disposés successivement sont sensiblement dans le même plan.

8. Le procédé selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** deux éléments (10, 11) sont prévus d'une pluralité de guides (45, 47), dans lequel la distance entre les guides (45, 47) de chaque élément (10, 11) est le double de la distance entre guides (41) des aiguilles (1) et dans lequel les guides (45, 47) de chaque élément (10, 11) sont alternativement disposés le long de la largeur de la machine à tisser.

9. Le procédé selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** trois éléments (10, 11, 54, 73, 74) sont prévus d'une pluralité de guides (45, 47, 55, 75, 77), dans lequel la distance entre les guides (45, 47, 55, 75, 77) de chaque élément (10, 11, 54, 73, 74) est triple la distance entre guides (41) des aiguilles (1) et dans lequel les guides (45, 47, 55, 75, 77) de chaque élément (10, 11, 54, 73, 74) sont disposés alternativement sur la largeur de la machine à tisser.

10. Le procédé pour former des foules pour la fabrication des tissus de gaze (53) selon l'une quelconque des revendications 1 à 9, utilisé pour former un tissu de gaze (53) sur une machine à tisser, dans lequel les aiguilles (1) de la pluralité des aiguilles (1) sont disposées sur la largeur de la machine à tisser et sont chacune prévues d'un guide (41) pour guider un fil de chaîne (40), dans lequel le au moins un élément (10, 11, 54, 73, 74), qui déplace la pluralité de fils de chaîne (44, 46, 56, 76, 78) le long des aiguilles (1) et transversalement aux aiguilles (1), est prévu d'une pluralité de guides (45, 47, 55, 75, 77) pour guider un fil de chaîne (44, 46, 56, 76, 78), et dans lequel le procédé comprend en outre la formation d'armures de gaze avec des fils de chaîne (44, 46, 56, 76, 78) guidés par le au moins un élément (10, 11, 54, 73, 74) et des fils de chaîne (41) guidés par des aiguilles (1).

11. Un dispositif pour former des foules pour la fabrication des tissus de gaze (53) ayant une pluralité d'aiguilles (1) chacune prévue d'un guide (41) pour guider un fil de chaîne (40) et d'au moins un élément (10, 11, 54, 73, 74) prévu d'une pluralité de guides (45, 47, 55, 75) pour guider un fil de chaîne (44, 46, 56, 76, 78) lequel élément est déplaçable pour déplacer les fils de chaîne (44, 46, 56, 76, 78) guidé par celui-ci le long des aiguilles et en direction transversale transversalement aux aiguilles, **caractérisé en ce que** les guides (45, 47, 55, 75) du au moins un élément (10, 11, 54, 73, 74) sont disposés en direction transversale dans distances qui sont un multiple de distances dans lesquelles se trouvent les guides (41) des aiguilles (1).

12. Le dispositif selon la revendication 11, **caractérisé en ce que** deux ou plusieurs éléments (10, 11, 54, 73, 74) sont prévus successivement dont au moins un élément est prévu de guides (45, 47, 55, 75, 77) dans distances qui sont un multiple de distances égales dans lesquelles se trouvent les guides (41) des aiguilles (1).

13. Le dispositif selon l'une quelconque des revendications 11 à 12, **caractérisé en ce que** les guides (45, 47, 55, 75, 77) des éléments (10, 11, 54, 73, 74) sont disposés de telle sorte qu'un guide (41) d'une aiguille (1) est disposé sensiblement en face d'un guide (45, 47, 55, 75, 77) de l'un des éléments (10, 11, 54, 73, 74).

14. Le dispositif selon l'une quelconque des revendications 11 à 13, **caractérisé en ce que** les éléments (10, 11, 54, 73, 74) sont disposés successivement le long de la direction de chaîne.

15. Le dispositif selon l'une quelconque des revendications 11 à 14, **caractérisé en ce qu'**en fonctionnement, les guides (45, 47, 55, 75, 77) des éléments (10, 11, 54, 73, 74) disposés successivement sont sensiblement dans le même plan.

16. Le dispositif selon l'une quelconque des revendications 11 à 15, **caractérisé en ce que** les aiguilles (1) sont disposées dans une position fixe et les éléments (10, 11, 54, 73, 74) sont disposés de manière qu'il peuvent être déplacés sensiblement dans la direction longitudinale des aiguilles (1) et transversalement à celles-ci.

17. Le dispositif selon l'une quelconque des revendications 11 à 16, **caractérisé en ce que** le dispositif comprend une unité d'entraînement (25) afin de déplacer au moins un des éléments (10, 11, 54, 73, 74) transversalement en avant et en arrière, laquelle unité d'entraînement (25) comprend au moins un moteur d'entraînement (30) commandable.

18. Le dispositif selon l'une quelconque des revendications 11 à 17, **caractérisé en ce que** les éléments (10, 11, 54, 73, 74) sont guidés dans un guide latéral (24) sensiblement dans la direction longitudinale des aiguilles (1) et sensiblement parallèles les uns aux autres.

19. Le dispositif selon l'une quelconque des revendications 11 à 18, **caractérisé en ce que** les fils de chaîne (40) qui sont guidés par les guides (41) des aiguilles (1) forment le plan inférieur des fils de chaîne dans la foule (51).

20. Utilisation d'un dispositif pour former des foules selon l'une quelconque des revendications 11 à 19 pour former un tissu de gaze (53) sur une machine à tisser, dans laquelle les aiguilles (1) de la pluralité des aiguilles (1) sont disposées sur la largeur de la machine à tisser.

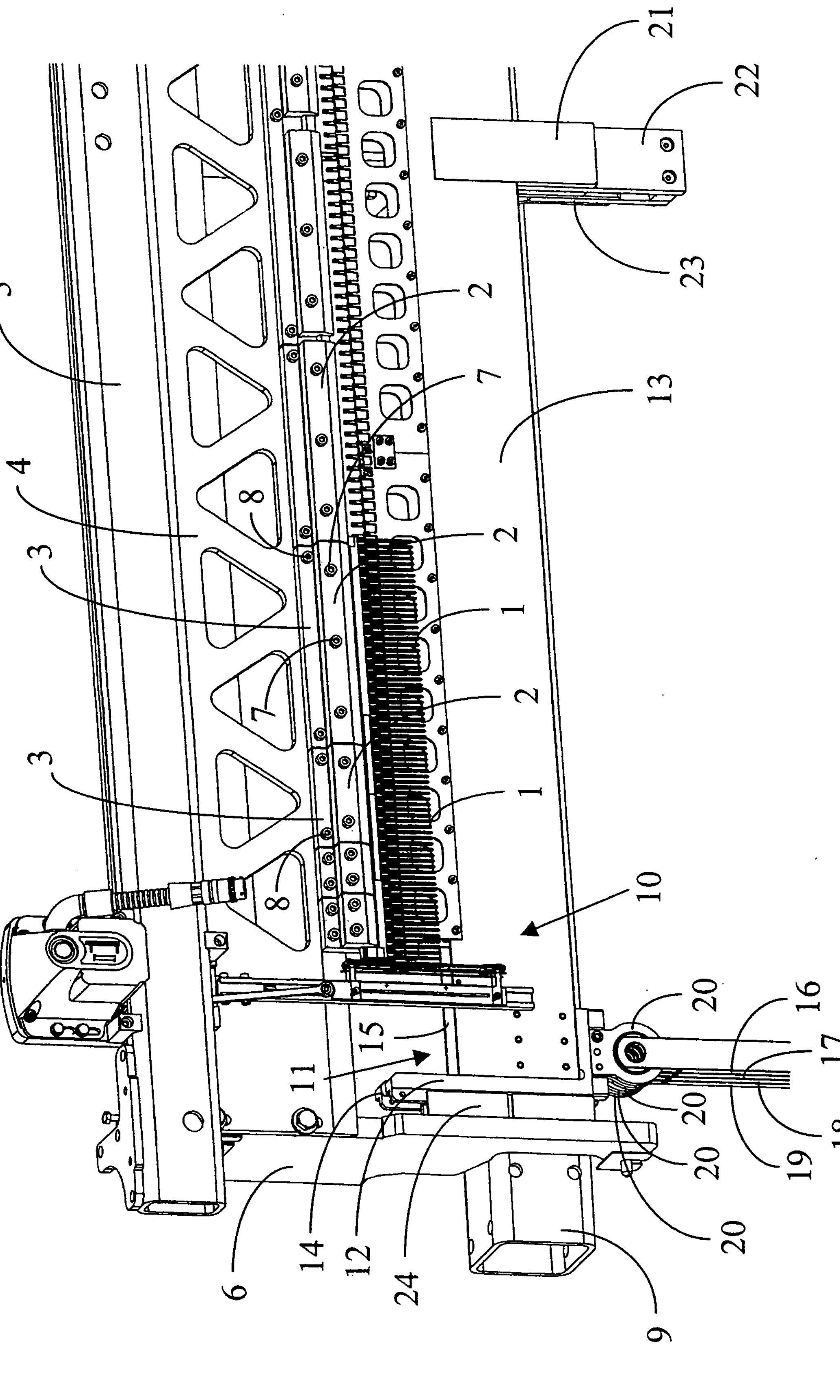

Fig. 1

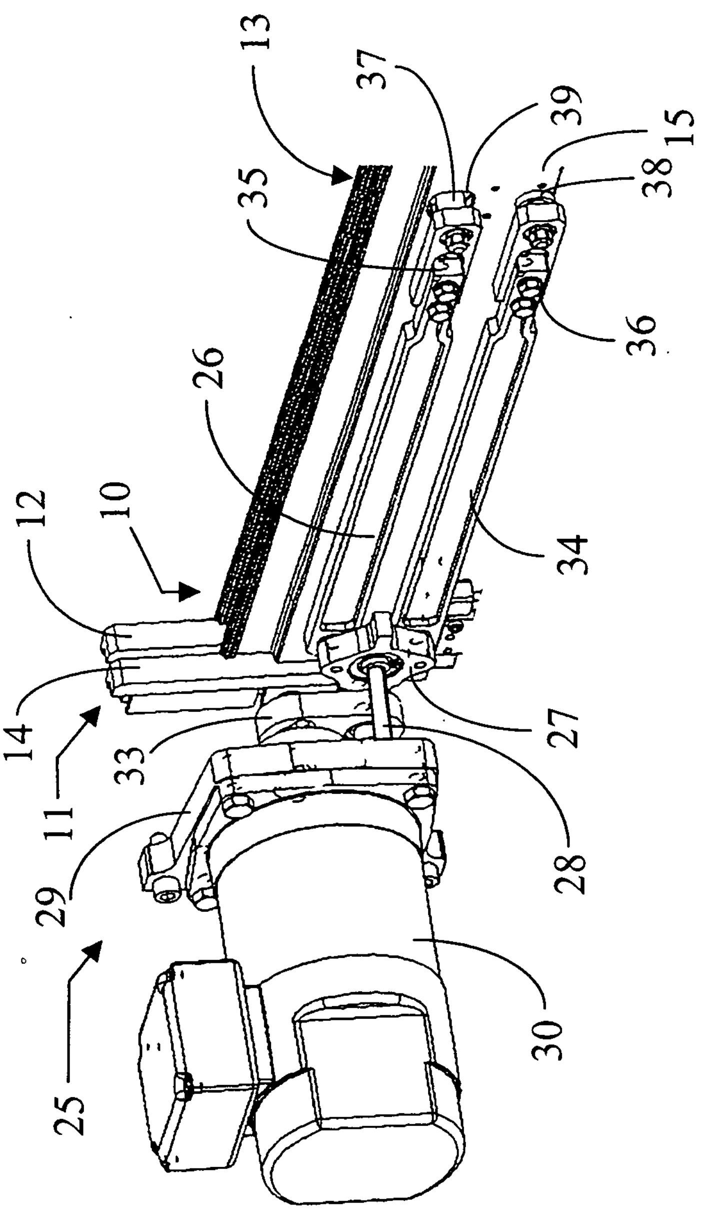

Fig. 2

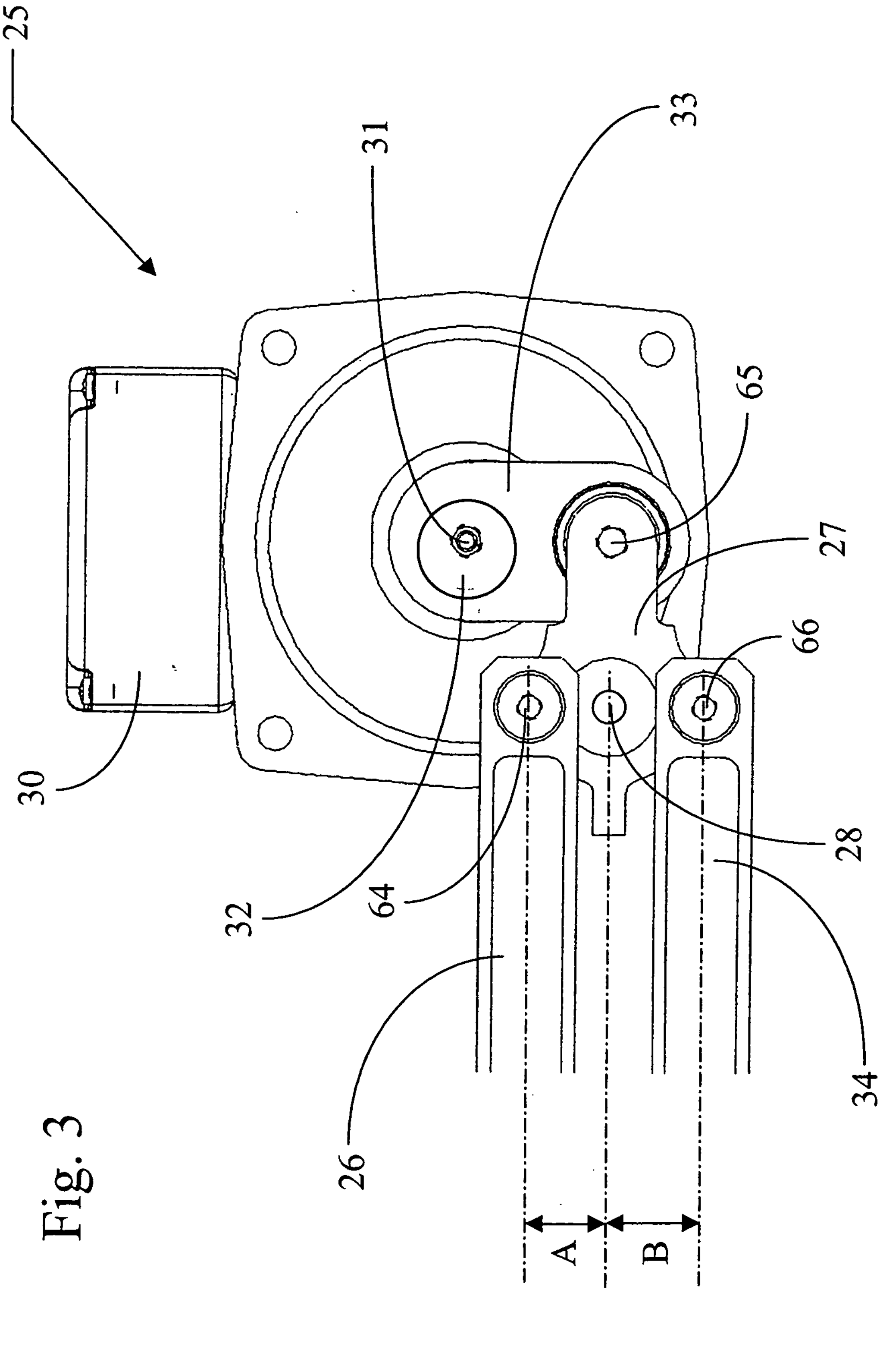

Fig. 3

Fig. 4

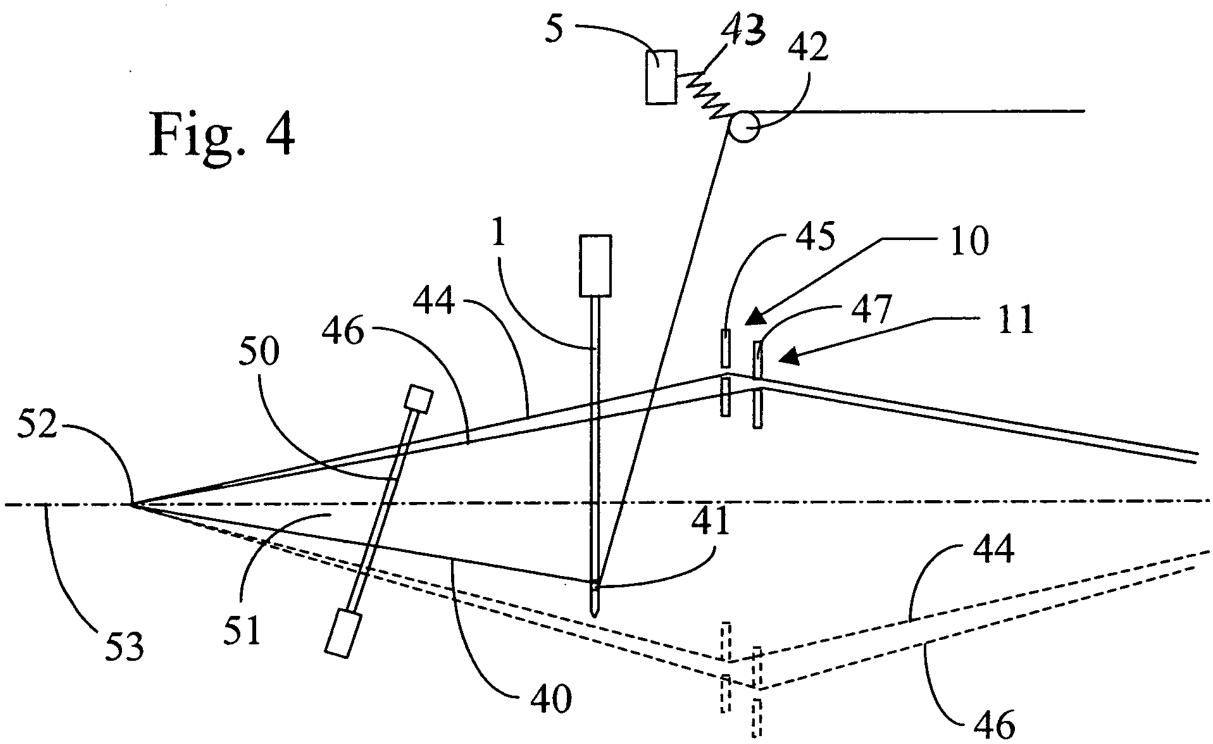
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Fig. 15

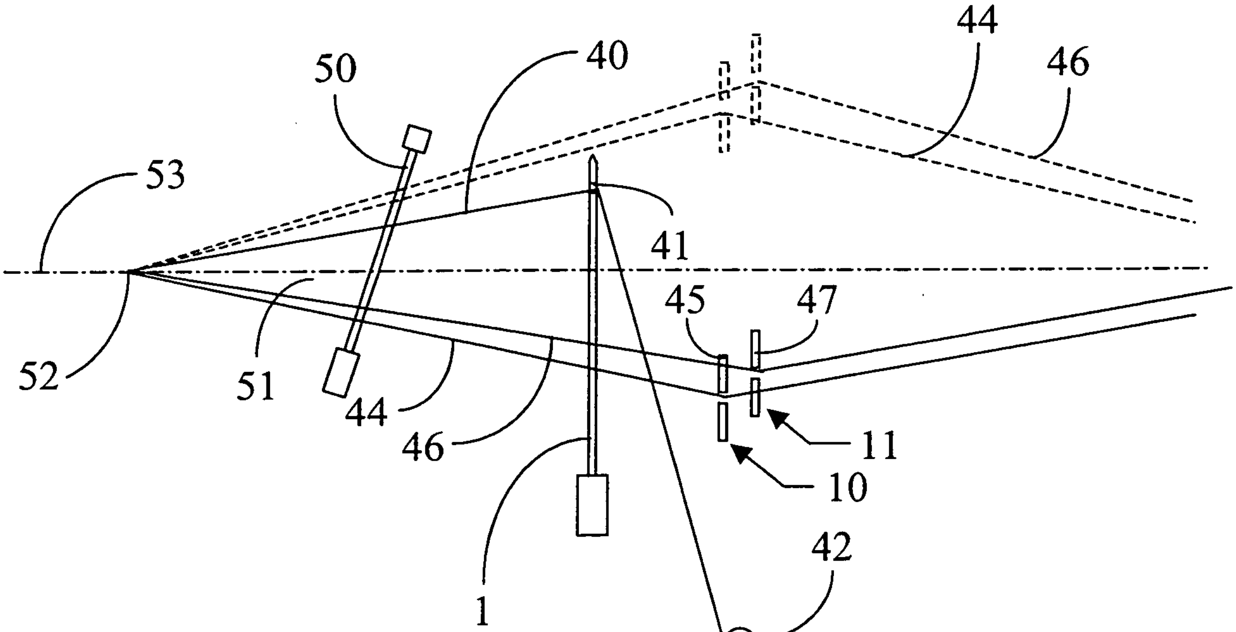
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Fig. 5

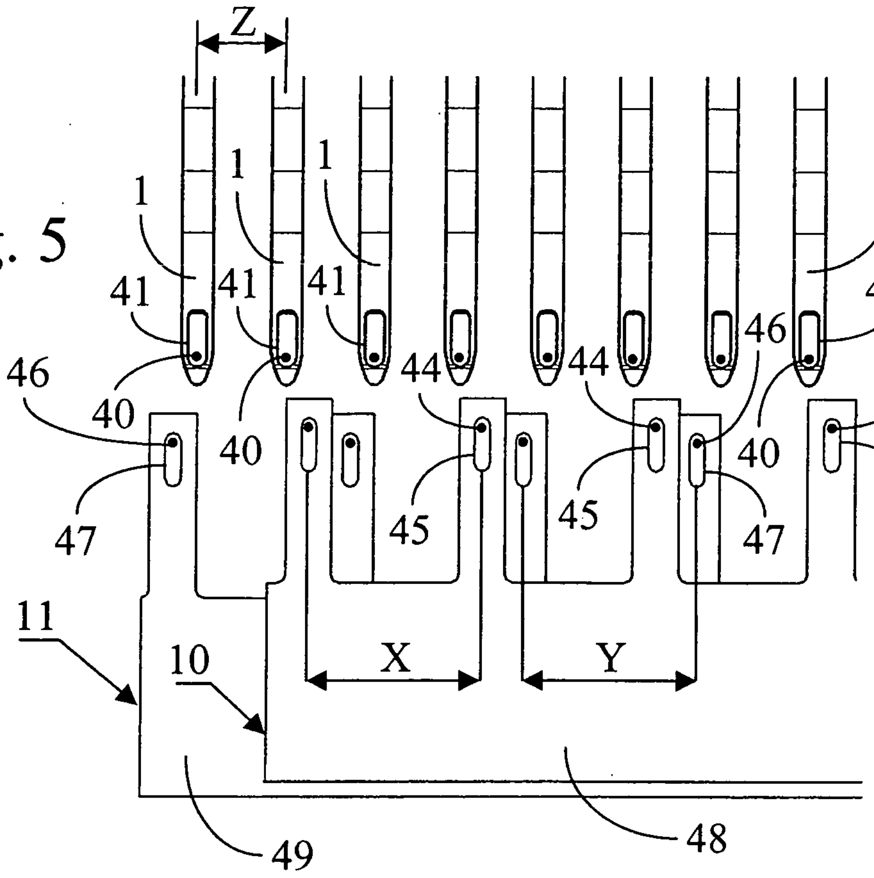
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Fig. 6

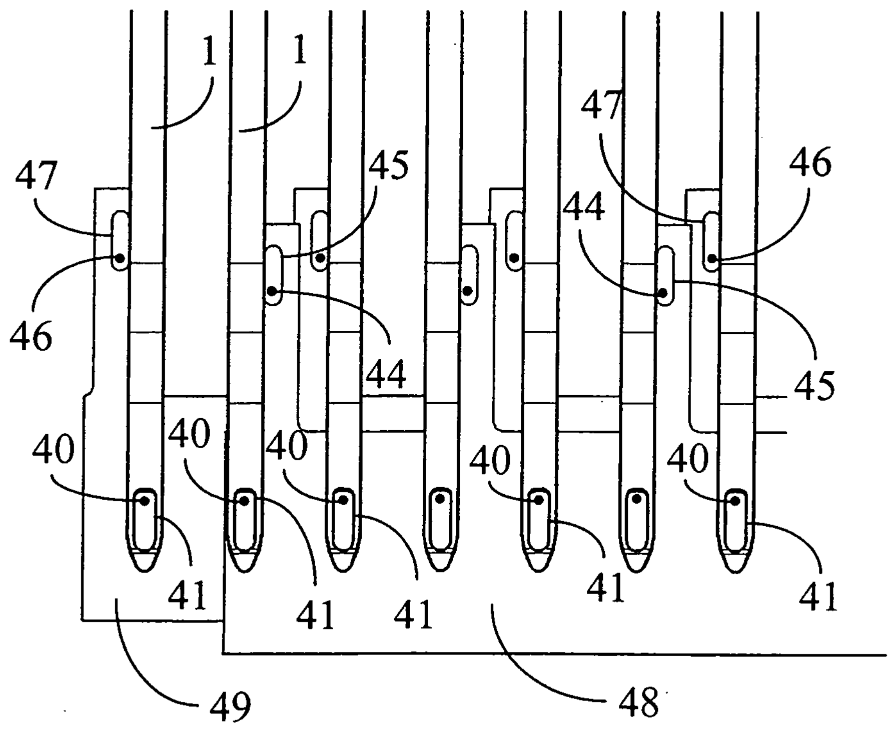
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Fig. 7

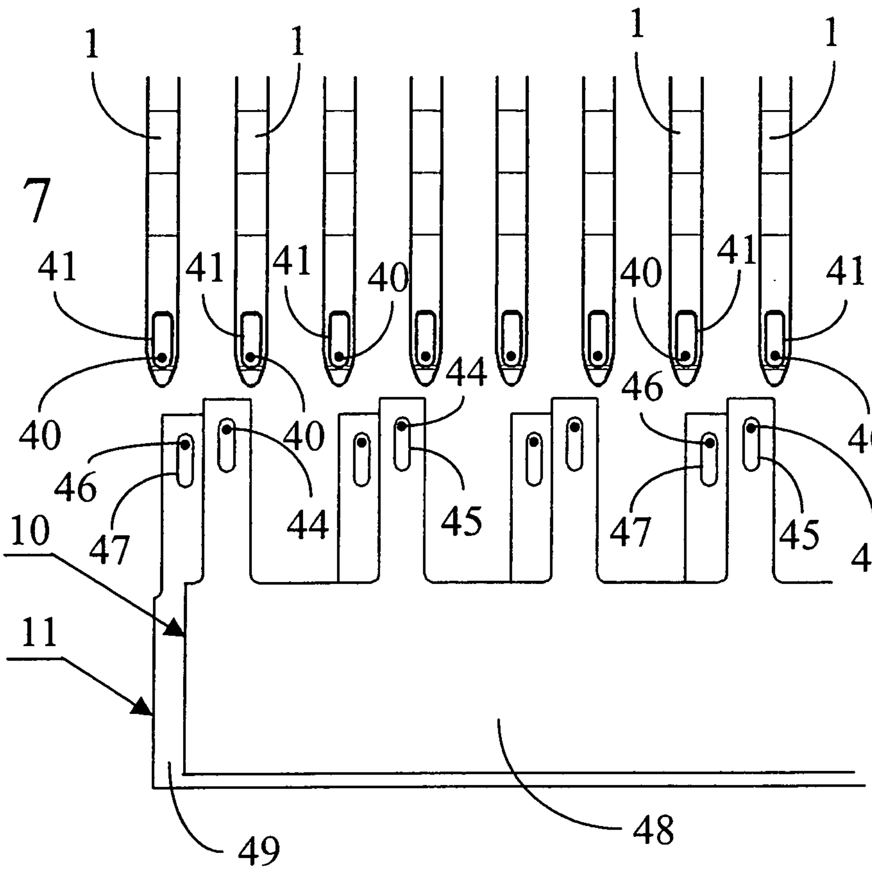
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Fig. 8

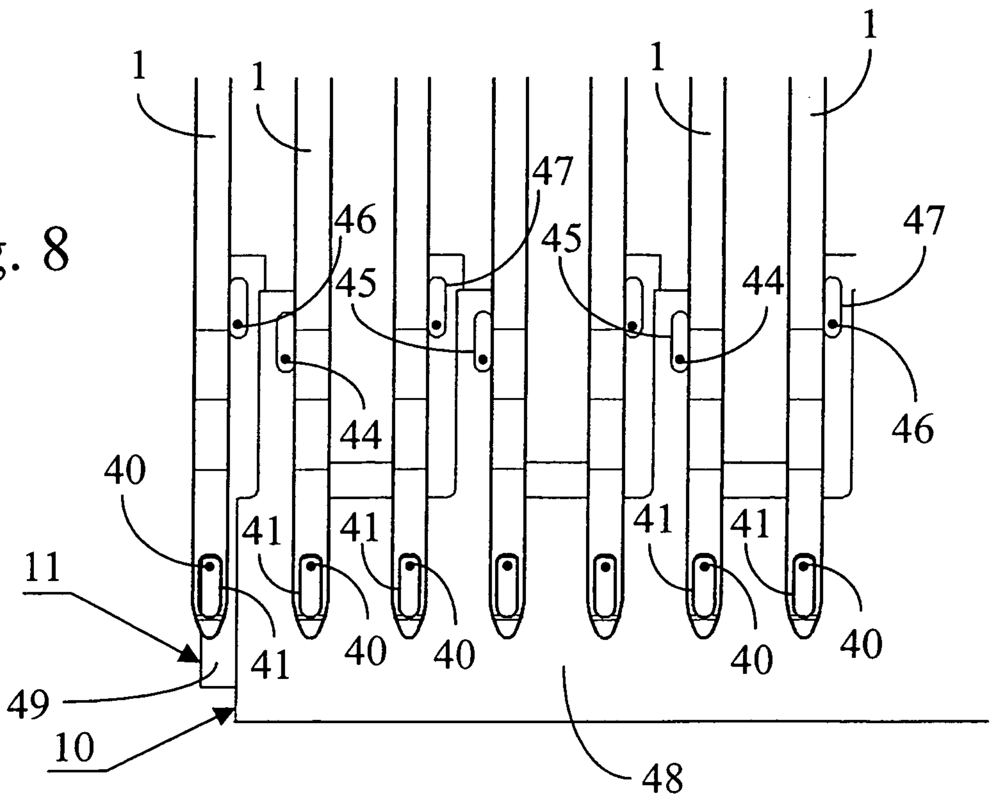
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Fig. 9

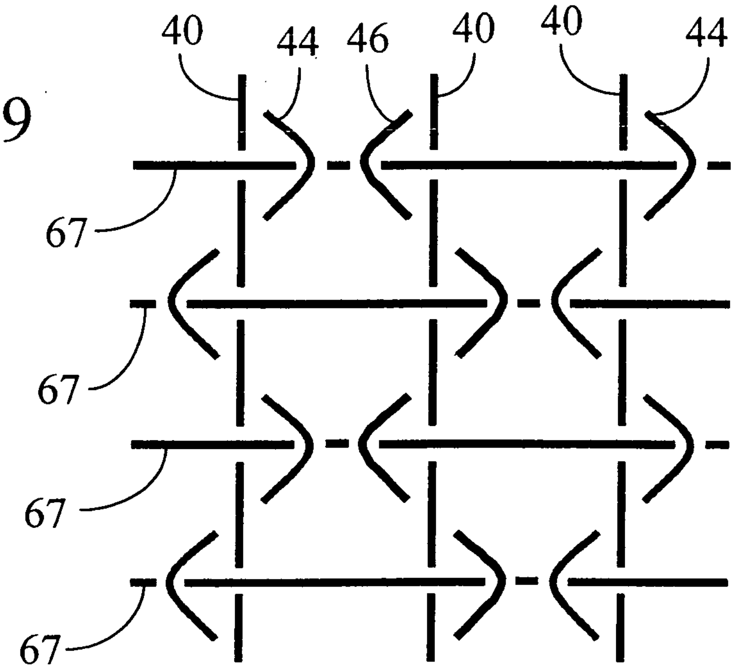
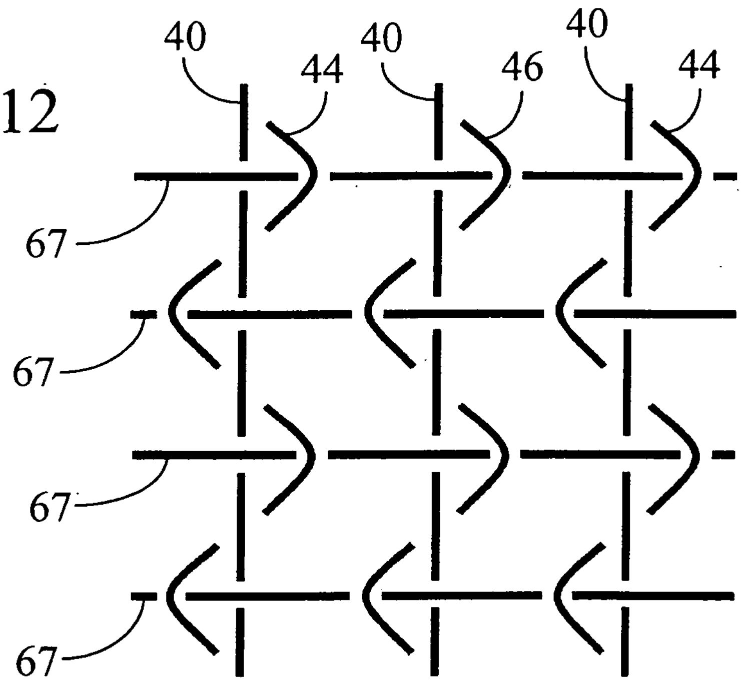


Fig. 12



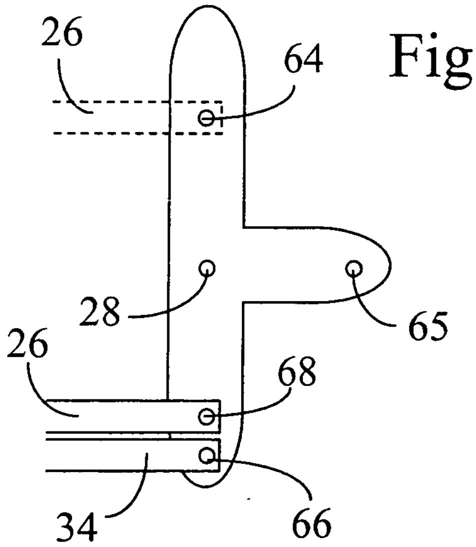
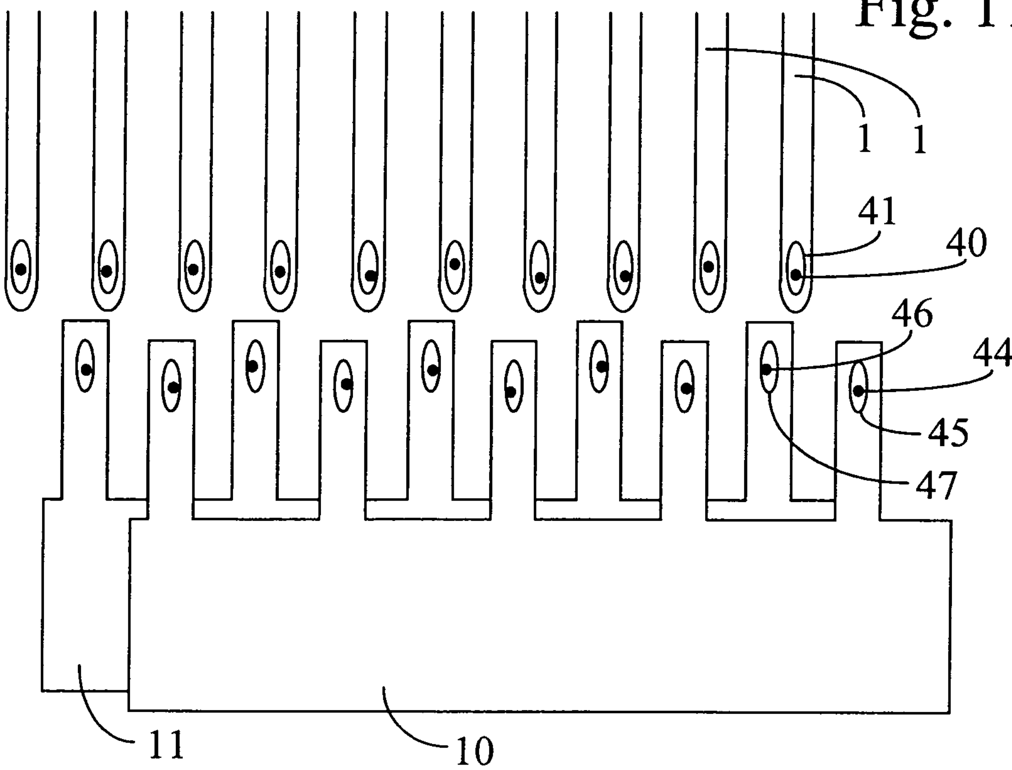


Fig. 10



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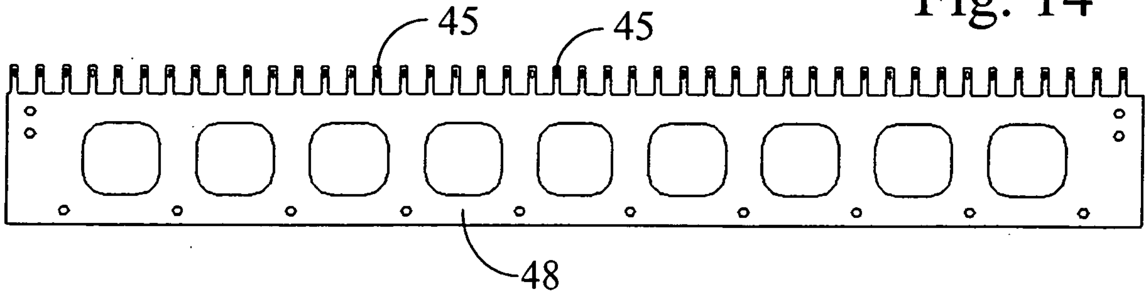

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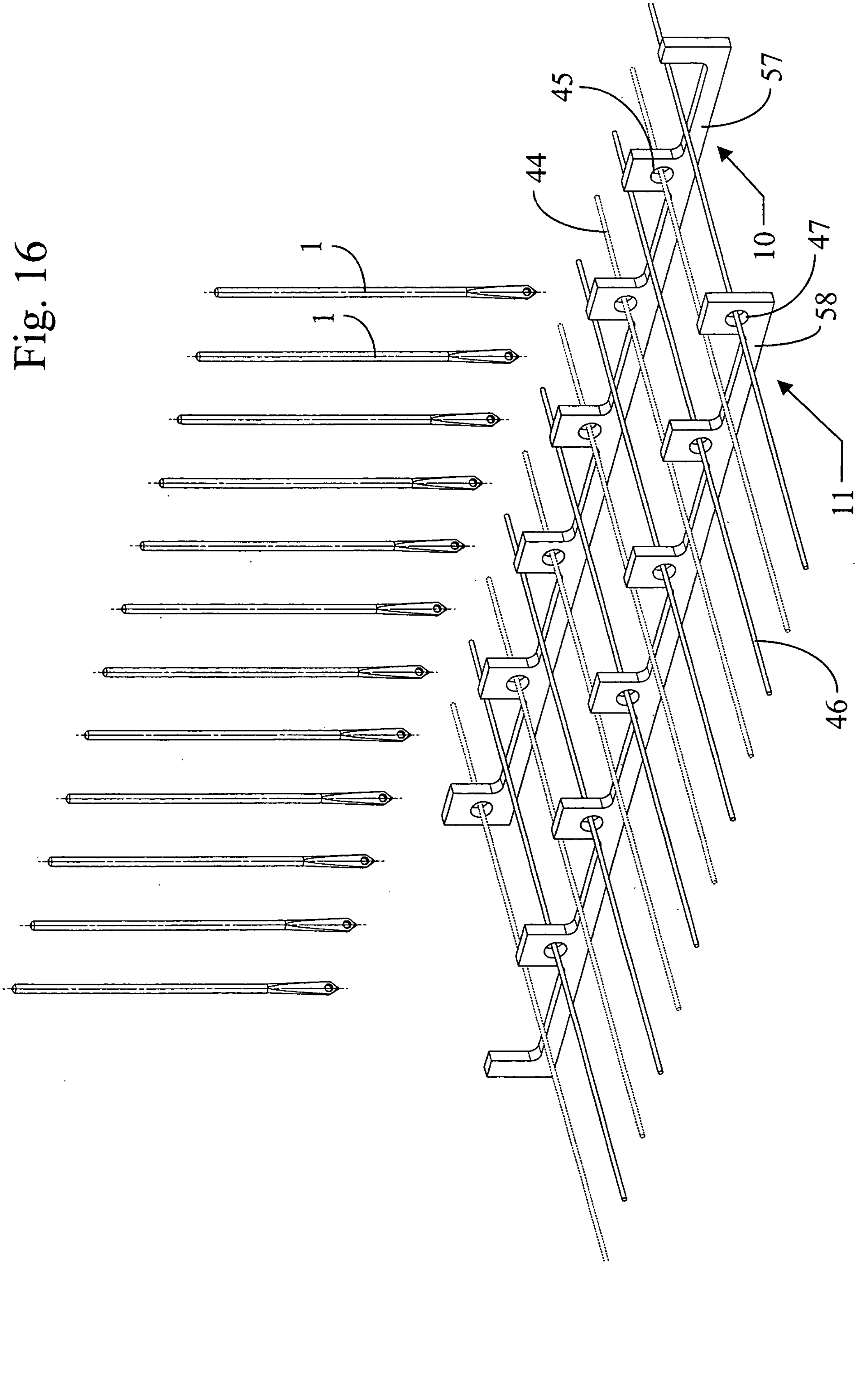

Fig. 16

Fig. 17

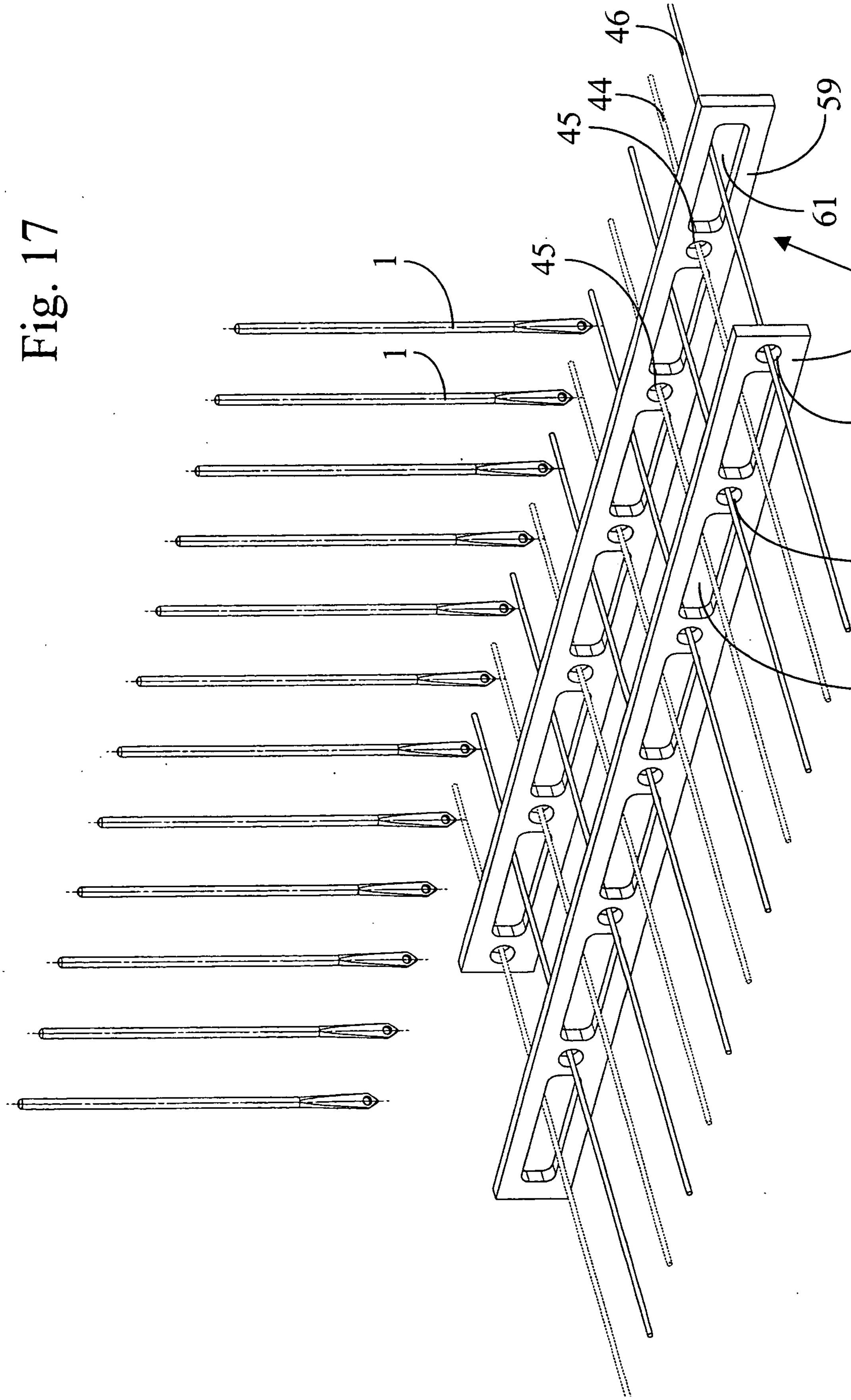

Fig. 13

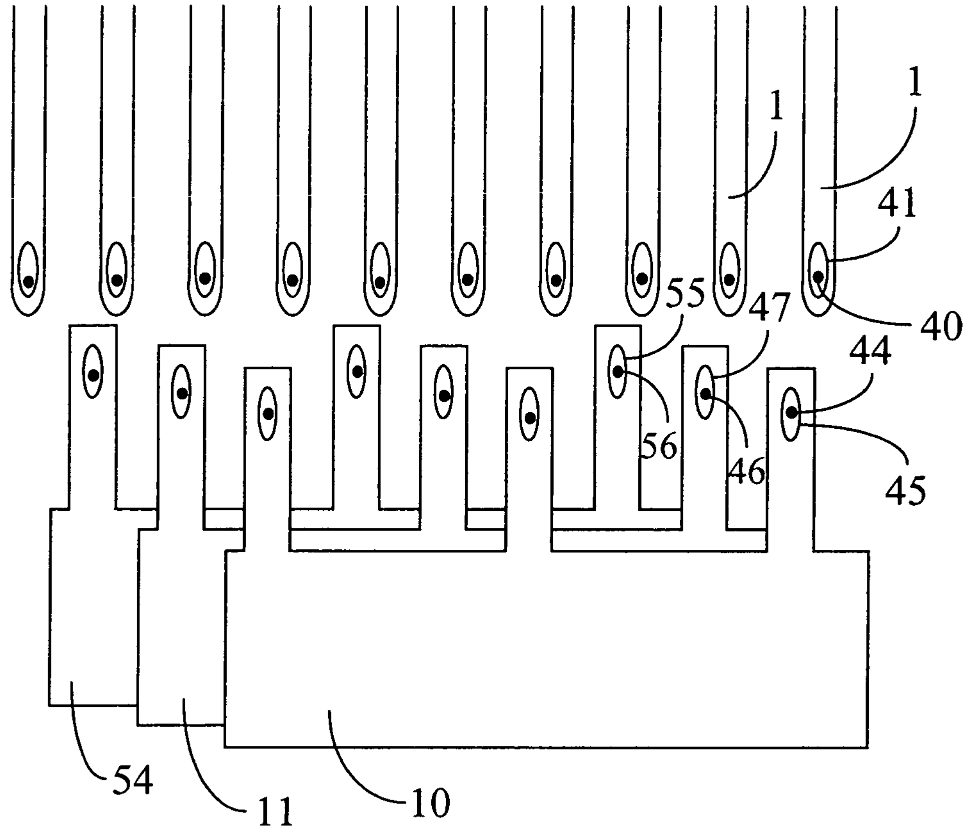
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Fig. 18

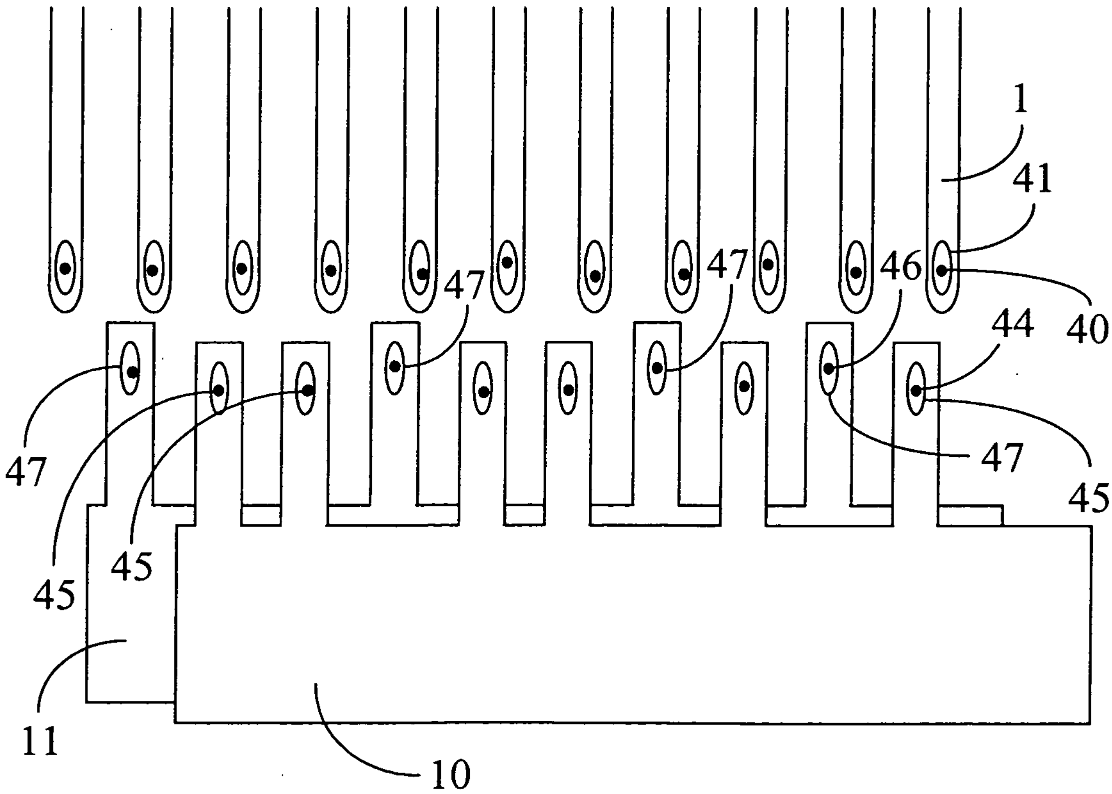
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Fig. 19

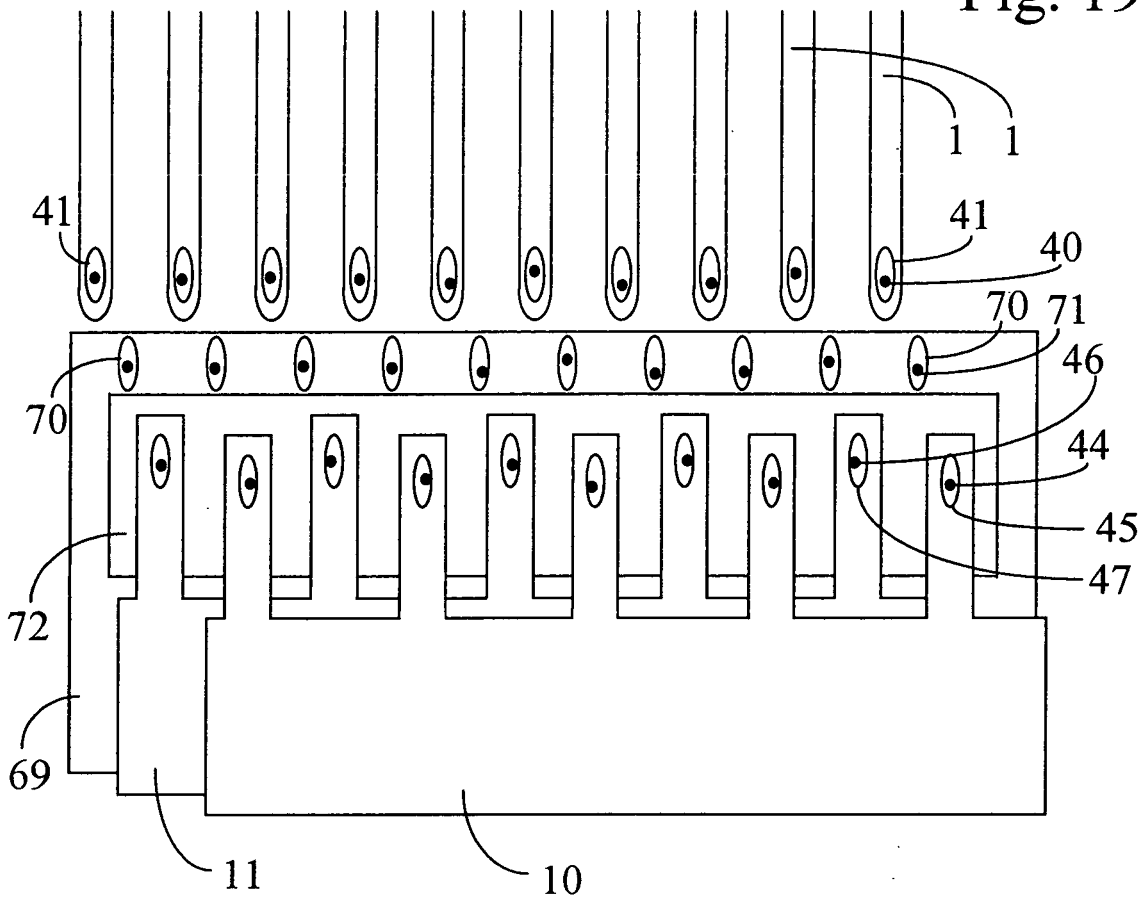
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Fig. 20

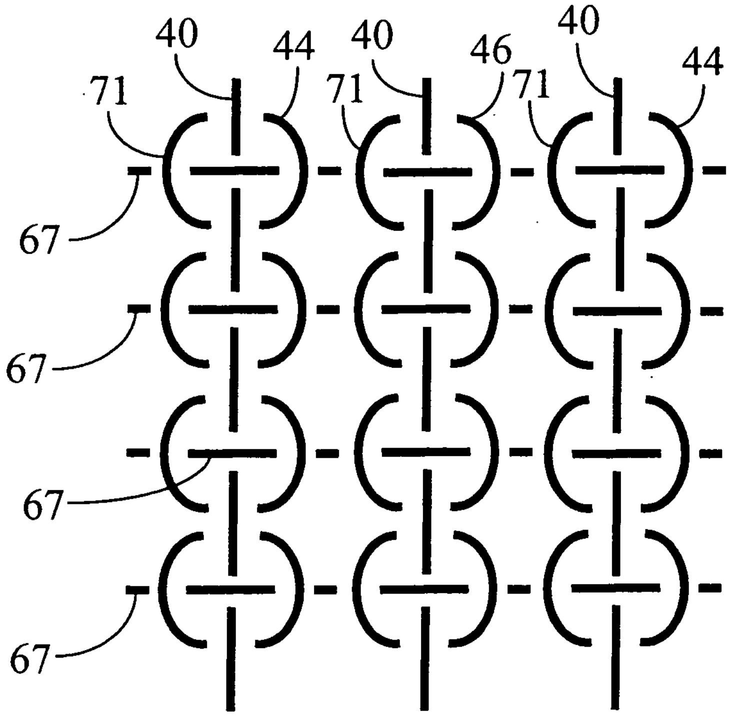
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Fig. 21

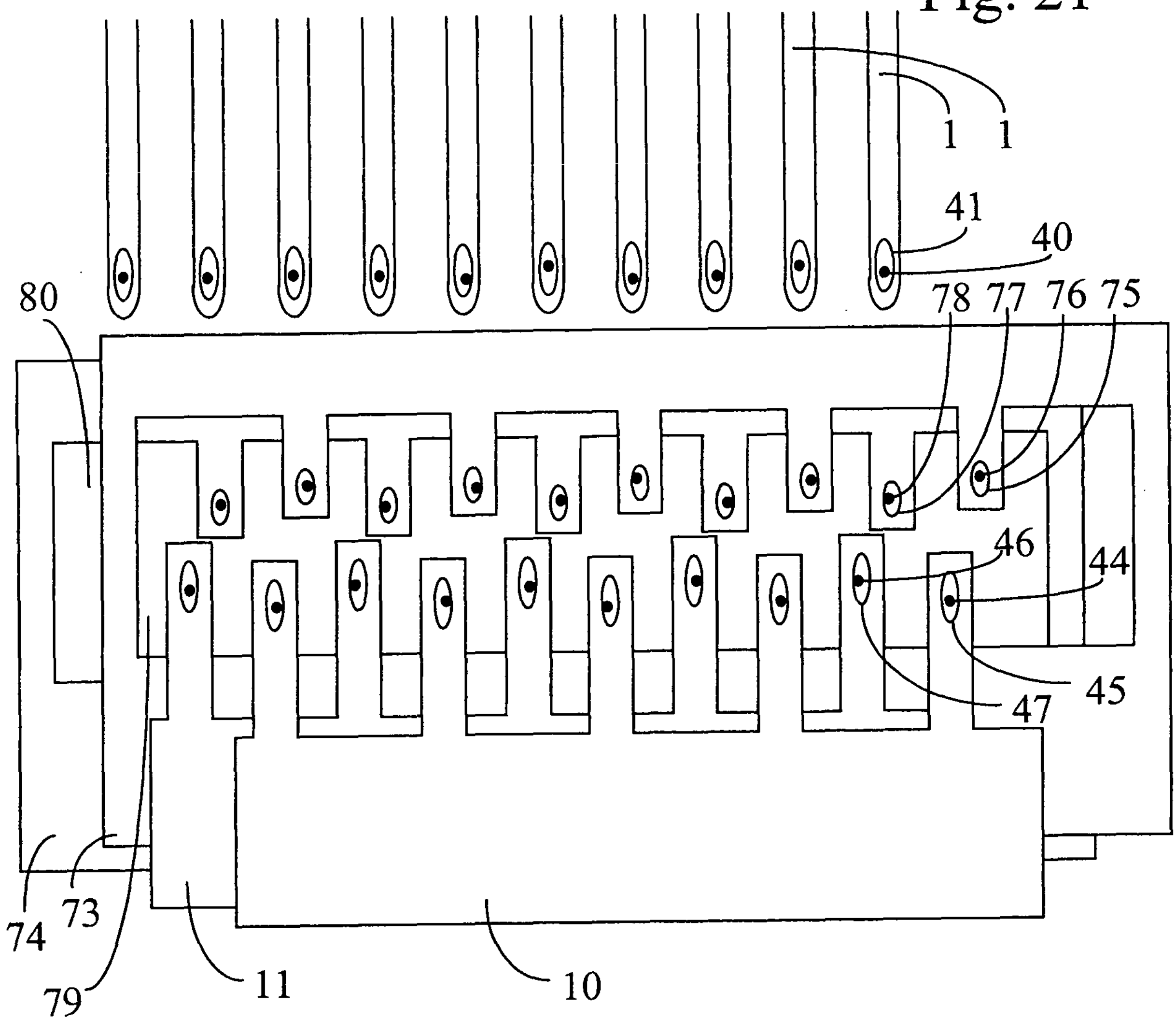
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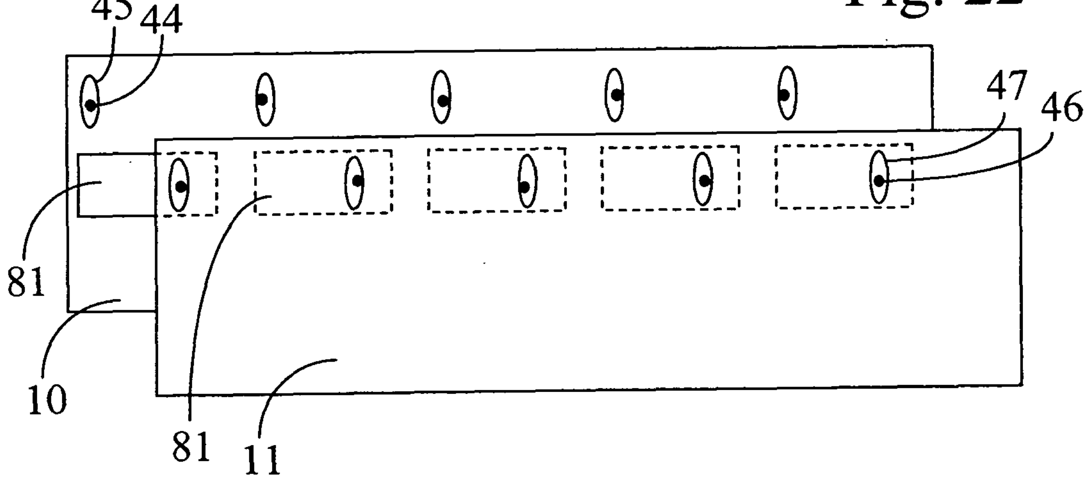
Fig. 22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REFERENCES CITED IN THE DESCRIPTION

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