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(54) **Method for face-to-face weaving of shadow velours**

(57) A method for face-to-face weaving of shadow velours fabrics in which two velours fabrics are woven with pile forming pile yarn tufts having a pre-determined orientation, each velours fabric having pile zones with a different aspect, because their pile yarn tufts have a different orientation, in order to form a pre-determined figure on each velours fabric and in which overlapping pile zones, having differently oriented pile yarn tufts are formed on the pile faces, facing one another, in parts (31),(32), (33),(34),(35),(36) of the face-to-face fabric, so that the projection of each figure produces a figure on the opposite pile face, which is different from the figure formed on the other pile face. This method makes it possible to determine the figures of the two velours fabrics independently of one another. If on the pile faces, facing each other, figures are formed, which when projected on the opposite pile face, are the mirror images of the figures formed on the other pile face, it is possible to obtain identical asymmetrical figures on both fabrics.

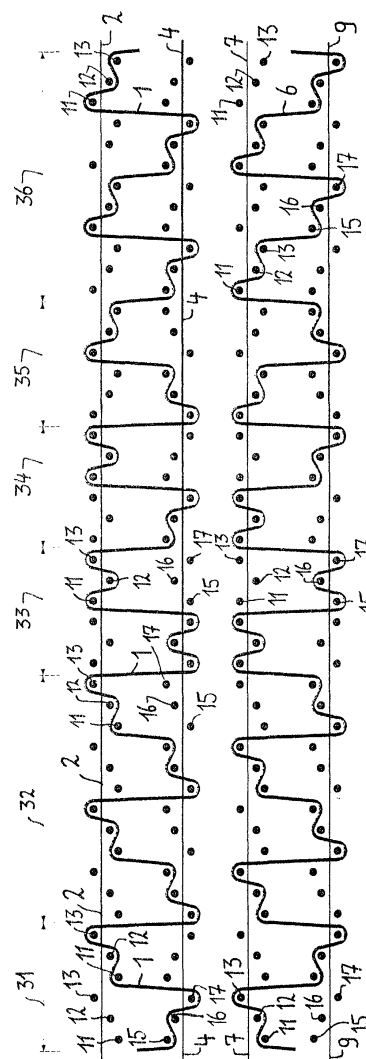


FIG. 19

EP 1 251 195 A1

Description

[0001] The present invention relates to a method for face-to-face weaving of shadow velours fabrics where two backing fabrics are woven over one another, when the pile yarns are interlaced alternately in the one and in the other backing fabric and then cut through between the backing fabrics, so that two velours fabrics are woven with pile forming pile yarn tufts having a pre-determined orientation on the pile faces, facing each other, and so that each velours fabric has at least one first pile zone and at least one second pile zone, the pile yarn tufts of which have a first and a second orientation respectively that is different, in order to form a pre-determined figure on each velours fabric.

[0002] Weaving shadow velours fabrics according to such a method is already known. On a so-called univelours weaving machine more warp yarn systems are provided, comprising tension warp yarns and binding warp yarns for an upper and a lower backing fabric. The tension warp yarns and the binding warp yarns can be positioned with respect to two weft insertion levels by means of a jacquard device with harness and by means of weaving frames, so that the weft yarns inserted on these levels during the successive insertion cycles are interlaced and so that finally two backing fabrics with respective tension warp yarns are obtained.

[0003] The warp yarn systems further comprise also pile yarns that can be positioned during weaving by means of pile weaving frames in order to be interlaced over a number of weft yarns in the upper and lower backing fabrics alternately. The pile weaving frames are controlled, for instance, by a shaft machine or a cam disc machine with a three position device. Thereafter the pile yarns are cut through between the two backing fabrics, so that two velours fabrics can be obtained with pile yarn tufts that extend towards the faces facing each other (the pile faces) of the fabrics. The pile yarns are all of the same colour, so that a unicoloured pile surface is obtained with these fabrics.

[0004] To bring yet some variety into these unicoloured pile surfaces and, for instance, to make a design, a pattern, a figure or a certain sign (numeral, character, logo) visible, it is known to make use of the possibility to influence the orientation of the pile yarn tufts. By giving the pile yarn tufts of different zones of the pile face (hereafter called "pile zones") a different orientation, these pile zones indeed get a different aspect. In this manner any figure can be made visible in the pile surface.

[0005] The orientation of a pile yarn tuft is determined by the relative positions of the weft yarns with respect to the tension warp yarn and therefore with respect to the weave of the tension warp yarn in the backing fabric. If in a 3/6 W-pile weave the tension warp yarn for the lower cloth is 2X under and 1X over, and for the upper cloth 2X over and 1X under, then the pile tufts will incline to the left (forward in the warp direction). Is the tension

warp yarn interlaced in the order 1X over and 2X under for the lower cloth and 1X under and 2X over for the upper cloth, then the pile tufts will incline to the right (backwards in the warp direction).

[0006] Therefore the desired orientation of the various pile yarn tufts is obtained by controlling the tension warp yarns. The jacquard device used to this effect should provide only two different positions for these tension warp yarns, because the tension warp yarns only take up the positions of the backing warp shed.

[0007] Additionally a colour effect in the fabrics can be obtained by weft selection. It is also possible, as described in EP 0 380 808, to give, in successive groups of three weft yarns, the first, the second and the third weft yarn respectively, each time a first, a second and a third colour, in order to make another colour visible at each orientation of the pile yarn tufts.

[0008] When applying the face-to-face weaving technique for making pile fabrics with a figure, the figure, which is obtained on the pile face of the one fabric, is always the mirror image of the figure obtained on the pile face of the other fabric. Indeed, these figures are formed above one another on the faces of the fabric facing each other, so that the projection of each figure on the other opposite pile face is identical with the figure formed on the other pile face. When the pile face of the upper fabric is turned upwards, the figure being the mirror image of the figure on the lower fabric is seen. With figures, which are symmetrical with respect to a central axis, this mirror image is identical with the figure itself, so that two fabrics with identical figures are obtained.

[0009] However, when the figures are asymmetrical, the figures on the fabrics are not identical. When the fabrics are laid one beside the other, the figures are seen as each other's mirror images with respect to a central axis coinciding with a fell of the fabric.

[0010] Also, with the method mentioned above for face-to-face weaving of shadow velours fabrics, it is only known to form equal pile zones with the pile yarns in parts of the upper and lower pile fabric situated above one another, so that the figure of the upper velours fabric and the figure of the lower velours fabric are either identical (with symmetrical figures) or each other's mirror image (with asymmetrical figures).

[0011] In other words, the known methods for weaving face-to-face shadow velours fabrics according to the face-to-face weaving technique have the disadvantage that the choice of a figure for the one velours fabric at the same time lays down the aspect of the figure on the other velours fabric. Up to this moment this was not considered as being a disadvantage, but as an inevitable consequence of applying the face-to-face weaving technique. Because a pile yarn effect in the upper fabric is realized by the same yarn as a pile yarn effect in the part of the lower fabric, lying underneath, it is assumed that also the effect should be identical. This, indeed, is certainly the matter if it is the colour of the pile yarn that causes the effect.

[0012] Consequently, the inventive part of the present invention is partly in the phrasing of the problem and in predicting the purpose to remedy this problem, and partly in the solution of this problem proposed by the method described in the present invention.

[0013] The said purpose is realized according to the present invention by providing a method for weaving shadow velours fabrics, having the characteristics mentioned in the first paragraph of the present description, in which the orientation of the pile yarn tufts is determined in such a manner that the faces of the velours fabrics, facing each other, overlap in at least one first pile zone of the one velours fabric and in at least one second pile zone of the other velours fabric, so that the projection of each figure on the opposite pile face, gives a figure that is different from the figure formed on the other pile face.

[0014] Because the point here is the effect as a result of the orientation of the pile yarn tufts in the respective fabrics, and not as a result of the characteristics of the pile yarn itself, the effect realized by a same pile yarn may be different in the upper and in the lower fabric. Because of this idea and by applying the method laid down in the present invention a figure may be obtained on the pile face of the one velours fabric, the projection of which on the opposite pile face of the other fabric is different from the figure on the other fabric.

[0015] Another problem of the known methods for producing shadow velours fabrics lies in the fact that it is not possible to weave two velours fabrics in which a same asymmetric figure is formed, because the figure of the one fabric will always be the mirror image of the figure of the other fabric.

[0016] By determining the orientation of the pile yarn tufts in such a manner that the projection of each figure on the opposite pile face produces a figure that is the mirror image of the figure produced on the other pile face, with respect to an axis that is parallel with a fell of the fabric, when applying the method according to the invention, this problem is also solved.

[0017] If the pile face of the upper velours fabric is turned up, the figure produces a mirror image with respect to an axis that is parallel with a fell of the fabric. Because of this, the asymmetric figure on the upper velours fabric becomes identical with the figure on the lower velours fabric. If, moreover, said axis also coincides with a fell of the fabric, the figure is produced also in the same place on both fabrics.

[0018] Preferably, the method is applied in such a manner that each velours fabric has also at least one third pile zone, the pile yarn tufts of which have a third orientation that differs from the said first and second orientations to form a pre-determined figure, together with each first and second pile zone on each velours fabric, whereas the orientation of the pile yarn tufts is determined in such a manner that, on the velours fabrics facing each other, at least one first pile zone and at least one third pile zone overlap, and/or at least one second

and at least one third pile zone overlap.

[0019] By applying three different orientation effects, fabrics with a greater figure forming variation in the pile zone are obtained. Just like the first and the second pile zones, also the first and the third pile zones and the second and the third pile zones may overlap, so that the two figures may be determined independently from one another and with a figure forming variety as great as possible.

[0020] In a preferred method a representation of the pile faces situated above one another is made beforehand, in which in different places of that representation has been indicated symbolically which orientation of the pile yarn tufts in the corresponding places situated above one another of the upper and lower velours fabrics should have to form the pre-determined figures.

[0021] A similar representation then serves as an auxiliary for realizing the control of the weaving machine and may be a so-called card design or "mise en carte". Such a card design is carried out, for example, as a grid, representing the weaving surface (the two fabrics above one another); each box of which represents one or more crossings of yarns of a warp yarn system and weft yarns. In each box is indicated, by a symbol, a sign or a colour, which orientation effect is wanted in that place in the places situated above one another on the velours fabrics to be woven. Preferably, the symbolic indications are given by means of a colour code.

[0022] In the said representation, four different symbolic indications can be used for instance, in the situation in which the pile yarn tufts in the upper and the lower velours fabric must have a same first orientation, in the situation in which the pile yarn tufts must have a first orientation in the upper velours fabric and a second orientation in the lower velours fabric, in the situation in which the pile yarn tufts must have a second orientation in the upper velours fabric and a first orientation in the lower velours fabric and in the situation in which the pile yarn tufts must have a same second orientation in the upper and in the lower velours fabric respectively. This will usually be the case if figures are to be obtained on the velours fabrics with overlapping first and second pile zones.

[0023] If figures will have to be obtained on the velours fabrics with overlapping first, second and third pile zones, each pile zone in a fabric can overlap three different pile zones in the other fabric, so that for the three pile zones, there are nine combinations in total. The nine different situations are indicated in the attached claim 7.

[0024] Preferably, the said different orientations are an upright orientation, an orientation slanting to the left in the warp direction or an orientation slanting to the right in the warp direction.

[0025] Preferably, with each symbolic indication in the said representation or card design, a weave is associated, determining the course of the warp yarns of at least one warp yarn system comprising a pile yarn, with respect to a number of weft yarns inserted successively,

in order to weave two backing fabrics from warp yarns and weft yarns and in doing so to give the pile yarn tufts of the said pile yarn in these backing fabrics the orientations, indicated by the symbolic indication concerned.

[0026] In the method according to the present invention, preferably a W-weave is used for the pile yarns. Although a 3/6-W-weave or a 4/8-W-weave is preferred any m/n-W-weave may be used.

[0027] Preferably, face-to-face weaving according to the present invention occurs when a number of warp yarn systems are provided that comprise a pile yarn and for each velours fabric a tension warp yarn and a binding warp yarn, if in addition thereto weft yarns are inserted between the yarns of each warp yarn system, so that two backing fabrics are woven with respective tension warp yarns and weft yarns woven in by binding warp yarns, when in this process pile yarns are woven in alternately over a group of three successive weft yarns in the upper backing fabric and over a group of three successive weft yarns in the lower backing fabric using a 3/6-W weave, and from each backing fabric are running to the other backing fabric between the third weft yarn of a group and the first weft yarn of a next group and when, in doing so, per warp yarn system the respective positions of the weft yarns of each group with respect to the tension warp yarns for each velours fabric are chosen from the possibilities given in claim 10 (a to i) in function of the desired orientations of the pile yarn tufts.

[0028] Another preferred method for weaving shadow velours fabrics according to the present invention is a method in which a number of warp yarn systems are provided, which comprise a pile yarn and for each velours fabric a tension warp yarn and a binding warp yarn, the weft yarns being inserted between the yarns of each warp yarn system, so that the two backing fabrics are woven with respective tension warp yarns and by weft yarns woven in by binding warp yarns, the pile yarns being woven in alternately over a group of four successive weft yarns in the upper fabric and a group of four successive weft yarns in the lower backing fabric using a 4/8-W-weave and are running to the other backing fabric from each backing fabric between the fourth weft yarn of a group and the first weft yarn of the next group, and whereby per warp yarn systems the respective positions of the four successive weft yarns of each group with respect to the tension warp yarns for each velours fabric being chosen per tension weft yarn, from the possibilities (a to i) given in claim 11 in function of the desired orientations of the pile yarn tufts.

[0029] A very preferred method is obtained when a weave with one of the options (a to i) according to claim 10 or a weave with the options (a to i) according to claim 11 is associated with each of the symbolic indications (for instance, with each different colour) in the representation or card design mentioned, the option for these weaves being taken, that produce the orientations indicated by the symbolic indication concerned.

[0030] Preferably, the said representation or card de-

sign is laid out as follows:

- a first auxiliary representation is made of the pile face of the one velours fabric, in which a symbolic indication is made in various places of that representation, which orientation the pile yarn tufts should have in the corresponding places of the pile face, in order to form the pre-determined figure on that velours fabric.
- a second auxiliary representation is made of a pile face, which is the mirror image of the pile face of the one velours fabric with respect to an axis coinciding with a fell of the fabric, in which in various places of that representation is indicated symbolically which orientation the pile yarn tufts should have in the corresponding places of that pile face, in order to form the mirror image.
- the two auxiliary representations are superposed or represented and by means of this arrangement or representation is determined, for each place of the card design, which orientations the pile yarn tufts should have in the corresponding places situated above one another of the upper and the lower velours fabric, and
- a different symbolic indication is applied to the surface of the final representation, for each different combination of pile yarn tufts to be realized above one another.

[0031] If required, the last step of this method may be split up into a series of successive steps in which the corresponding symbolic indications are applied to the representation or card design for one specific combination of orientations.

[0032] Preferably, the first auxiliary representation represents the pile face for the lower fabric, whereas the second auxiliary representation then represents the mirror image to be formed on the upper fabric. It is however possible to work the other way round and form the mirror image on the lower fabric. In this method the auxiliary representation for the upper fabric is preferably placed on the auxiliary representation for the lower fabric. It may, however, also be done the other way round.

[0033] The method for weaving shadow velours fabrics with figures on the opposite pile faces producing the mirror image of the figure formed on that other pile face on the opposite pile face when projected, can also be automated by means of a computer, on the basis of orientations of pile yarn tufts on the one fabric by automatically determining the orientations of the pile yarn tufts on the other fabric, that are necessary to obtain the figures desired on the fabrics (figures, which produce the mirror image of the figure formed on the opposite pile face when projected on the opposite pile face).

[0034] In order to obtain the figures mentioned above by means of mirror image projections, the representation mentioned above of the pile faces situated above one another of the velours fabrics may be laid out auto-

matically, with the help of a computer. This may be done on the basis of an auxiliary representation of the pile face of one of the two fabrics, in which in various places of this auxiliary representation it is symbolically indicated which orientation the pile yarn tufts should have in the corresponding places of the pile face in order to form the pre-determined figure on that velours fabric.

[0035] The software and/or computer systems and/or actions or instructions prescribed which have been developed to implement such a method are means to implement the protected method (or to have it implemented) and are therefore within the scope of the present invention and within the scope of protection of the present patent (application).

[0036] In the following description a possible method according to the present invention is described in a more detailed manner. The only purpose of this description is to further clarify the characteristics and advantages of the invention. Therefore, this description can in no way be interpreted as a limitation of the field of application of the invention, neither as the scope of this patent protection, as determined in the attached claims.

[0037] In this description reference is made, by means of reference numbers, to the attached figures, of which:

- the figures 1 to 18 each represent a different weave for face-to-face weaving according to the present invention, each figure representing two warp yarn systems provided next to one another, in schematic cross-sections of the face-to-face fabrics represented below one another respectively and indicating on them which positions the yarns of these warp yarn systems take up with respect to a number of warp yarns and where a 3/6-W-weave is used in the weaves as shown in the figures 1 to 9, and a 4/8-W-weave is used in the weaves shown in the figures 10 to 18;
- figure 19 shows in respective schematic cross-sections (represented below one another) of two warp yarn systems provided next to one another, during face-to-face weaving of shadow velours fabrics with various combinations of orientations of the pile warp tufts in overlapping parts of the fabrics.
- figures 20 to 22 show two intermediate steps and the final result respectively of a method for making a card design for face-to-face weaving of two identical velours fabrics in which a "2" is formed by pile yarn tufts oriented in a different manner.

[0038] In face-to-face weaving of shadow velours a series of warp yarn systems is provided next to one another. Each warp yarn system comprises a pile yarn (1), (6), a tension warp yarn (2), (7) and a binding warp yarn (3), (8) for the upper backing fabric (19) and a tension warp yarn (4) (9) and a binding warp yarn (5), (10) for

the lower backing fabric (20).

[0039] In a successive weft insertion cycle each time a respective weft yarn (11), (12), (13), (14); (15), (16), (17), (18) is inserted into a shed between the yarns (1-10) of each warp yarn system at an upper and a lower insertion level. In this shed these yarns (1-10) are positioned in such a manner with respect to the insertion levels that the binding warp yarns (3), (8), (5), (10), the tension warp yarns (2), (7), (4), (9) and the weft yarns (11), (12), (13), (14); (15), (16), (17), (18) form two backing fabrics (19), (20) above one another, whereas the pile yarns (1), (6) are interlaced over a group of weft yarns alternately in the upper (19) and in the lower backing fabric (20).

[0040] The pile yarns (1), (6) of successive warp yarn systems (combine the two cross-section of each of the figures 1 to 18) are each time interlaced opposite one another in a different backing fabric and are crossing each other between the two fabrics. In each fabric and in each warp yarn system the binding warp yarn (3), (8), (5), (10) runs alternately over and under a weft yarn (11-14), (15-18). The binding warp yarns (3), (8), (5), (10) of two warp yarn systems provided next to one another, running over and under a same weft yarn respectively and are crossing one another between two successive weft yarns. Hence the weft yarns are interlaced and an upper (19) and a lower backing fabric (20) is constituted. Thereafter, the pile yarns (1), (6) are cut through between the two backing fabrics (19), (20), so that velours fabrics are obtained having a series of upright and/or slanting pile yarn tufts on the faces directed towards one another.

[0041] In the figures 1 to 18 is shown, each time for two warp yarn systems situated next to one another, which positions the binding warp yarns (3), (8), (5), (10), the tension warp yarns (2), (7), (4), (9) and the pile yarns (1), (6) take up with respect to the successive weft yarns (11), (12), (13), (14); (15), (16), (17), (18).

[0042] With the weaves as shown in the figures 1 to 9 there are successive series of three weft yarns (11), (12), (13); (15), (16), (17) of a group in each backing fabric (19), (20). The pile yarns (1), (6) are interlaced with a 3/6-W-weave, alternately in the one and in the other backing fabric over the three weft yarns (11), (12), (13); (15), (16), (17) of a group and then run between the third weft yarn (13), (17) of a group and the first weft yarn (11), (15) of the next group to the other backing fabric.

[0043] With the weave as shown in figure 1 the three successive weft yarns (11-13); (15-17) of each group are interlaced in the upper backing fabric over, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over and under the tension warp yarn (4), (9). Because of this the first (11), (15) and third weft yarns (13), (17) of each group in the upper (19) and in the lower backing fabric (20) are interlaced in the fabric on the same level, so that the pile yarn tufts standing off each time between a first (11), (15) and a third weft yarn (13), (17) will stand upright in

the upper and lower velours fabric.

[0044] With the weave shown in figure 2 the three successive weft yarns (11-13);(15-17) of each group in the upper backing fabric (19) are interlaced under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) are interlaced over, over and under the tension warp yarn (4), (9) respectively. Because of this the third weft yarns (13), (17) of each group in the upper (19) and the lower backing fabric (20) are interlaced closer to the back of the fabric than the first weft yarns (11),(15), so that the pile yarn tufts in the upper (19) and the lower (20) velours fabric will be oriented in the direction of the third weft yarn (13), (17) - in the figure this means to the left.

[0045] With the weave shown in figure 3 the three weft yarns (11-13);(15-17) of each group are interlaced in the upper backing fabric (19) over, under and under the tension warp yarn (2), (7) and in the lower backing fabric (20) under, over and over the tension warp yarn (4), (9). Because of this the first weft yarns (11), (15) of each group in both backing fabrics (19), (20) are interlaced closer to the back of the fabric than the third weft yarns (13),(17), so that the pile yarn tufts in both velours fabrics will be oriented in the direction of the first weft yarn (11), (15) - to the right in the figure.

[0046] With the weave shown in figure 4 the three successive weft yarns (11-13);(15-17) of each group in the upper backing fabric (19) are interlaced under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over and over the tension warp yarn (4), (9) respectively. Because of this the third weft yarns (13) in the upper backing fabric (19) are interlaced closer to the back of the fabric than the first weft yarns (11). In the lower backing fabric (20) it is just the other way round, so that the pile yarn tufts in the upper (19) and in the lower velours fabric (20) will be oriented in the direction of the third weft yarns (13) - to the left - and in the direction of the first weft yarns (15) - to the right.

[0047] With the weave shown in figure 5 the three successive weft yarns (11-13); (15-17) of each group in the upper backing fabric (19) are interlaced over, under and under the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) over, over and under the tension warp yarn (4), (9) respectively. Because of this the pile yarn tufts (13) in the upper and the lower velours fabric are oriented in the direction of the first weft yarns (11) - to the right - and in the direction of the third weft yarns (17) - to the left - respectively.

[0048] With the weave shown in figure 6 the three successive weft yarns (11-13);(15-17) of each group in the upper backing fabric (19) are interlaced under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over and under the tension warp yarn (4), (9) respectively. Because of this the pile yarn tufts in the upper velours fabric will be oriented in the direction of the third weft yarns (13) - to the left - and in the lower velours fabric, pile yarn tufts

standing upright will be obtained.

[0049] With the weave shown in figure 7 the three successive weft yarns (11-13); (15-17) of each group in the upper backing fabric (19) are interlaced over, under and under the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over and under the tension warp yarn (4),(9) respectively. Because of this the pile yarn tufts in the upper velours fabric will be oriented in the direction of the first weft yarns (11) - to the right - and in the lower velours fabric, pile yarn tufts standing upright will be obtained.

[0050] With the weave shown in figure 8 the three successive weft yarns (11-13);(15-17) of each group in the upper backing fabric (19) are interlaced over, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) over, over and under the tension warp yarn (4),(9) respectively. Because of this, pile yarn tufts standing upright will be obtained in the upper velours fabric and in the lower velours fabric, the pile yarn tufts will be oriented in the direction of the third weft yarns (17) - to the left.

[0051] With the weave shown in figure 9 the three successive weft yarns (11-13);(15-17) of each group in the upper backing fabric (19) are interlaced over, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over and over the tension warp yarn (4), (9) respectively. Because of this, pile yarn tufts standing upright will be obtained in the upper velours fabric and in the lower velours fabric, the pile yarn tufts will be oriented in the direction of the first weft yarns (15) - to the right.

[0052] With the weaves shown in the figures 10 to 18 there are successive groups of four weft yarns (11), (12), (13), (14) ; (15) , (16) , (17), (18) in each backing fabric (19), (20). The pile yarns (1), (6) are interlaced over the four weft yarns (11) , (12) , (13) , (14) ; (15), (16), (17), (18) of a group alternately in the one and in the other backing fabric, using a 4/8-W-weave, and then run between the fourth weft yarn (14),(18) of a group and the first weft yarn (11), (15) of the next group to the other backing fabric.

[0053] With the weave shown in figure 10 the four successive weft yarns (11-14);(15-18) of each group in the upper backing fabric (19) are interlaced over, under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over, over and under the tension warp yarn (4), (9) respectively. Because of this, pile yarn tufts standing upright will be obtained in both fabrics, because the first (11), (15) and fourth weft yarns (14), (18) in each fabric are running on the back of the tension warp yarns (2), (7), (4), (9).

[0054] With the weave shown in figure 11 the four successive weft yarns (11-14); (15-18) of each group in the upper backing fabric (19) are interlaced under, under, over and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) over, over, under and under the tension warp yarn (4), (9) respectively. Because of this the fourth weft yarns (14), (18) of each

group in the upper backing fabric (19) and the lower backing fabric (20) are interlaced closer to the back of the fabric than the first weft yarns (11), (15), so that the pile yarn tufts in the upper and in the lower velours fabric will be oriented in the direction of the fourth weft yarn (14),(18) - to the left.

[0055] With the weave shown in figure 12 the four successive weft yarns (11-14); (15-18) of each group in the upper backing fabric (19) are interlaced over, over, under and under the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, under, over and over the tension warp yarn (4), (9) respectively. Because of this the first weft yarns (11), (15) of each group in the upper (19) and the lower backing fabric (20) are interlaced closer to the back of the fabric than the fourth weft yarns (14), (18), so that the pile yarn tufts in the upper and in the lower velours fabric will be oriented in the direction of the first weft yarn (11),(15) - to the right.

[0056] With the weave shown in figure 13 the four successive weft yarns (11-14); (15-18) of each group in the upper (19) and lower backing fabric (20) are interlaced under, under, over and over the tension warp yarn (2), (7),(4),(9) respectively. Because of this the pile yarn tufts in the upper velours fabric will be oriented slantwise to the left and in the lower velours fabric slantwise to the right.

[0057] With the weave shown in figure 14 the four successive weft yarns (11-14); (15-18) of each group in the upper and lower backing fabric (20) are interlaced over, over, under and under the tension warp yarn (2),(7),(4), (9) respectively. Because of this the pile yarn tufts in the upper velours fabric will be oriented slantwise to the right and in the lower velours fabric slantwise to the left.

[0058] With the weave shown in figure 15 the four successive weft yarns (11-14); (15-18) of each group in the upper backing fabric (19) are interlaced under, under, over and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over, over and under the tension warp yarn (4), (9) respectively. Because of this, pile yarn tufts in the upper velours fabric, oriented slantwise to the left and in the lower velours fabric, standing upright are obtained.

[0059] With the weave shown in figure 16 the four successive weft yarns (11-14) ; (15-18) of each group in the upper backing fabric (19) are interlaced over, over, under and under the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over, over and under the tension warp yarn (4), (9) respectively. Because of this, pile yarn tufts in the upper velours fabric, oriented slantwise to the right and in the lower velours fabric, standing upright are obtained.

[0060] With the weave shown in figure 17 the four successive weft yarns (11-14);(15-18) of each group in the upper backing fabric (19) are interlaced over, under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, over, under and under the tension warp yarn (4), (9). Because of this, pile yarn tufts in the upper velours fabric standing

upright will be obtained and in the lower velours fabric pile yarn tufts will be oriented slantwise to the left.

[0061] With the weave shown in figure 18 the four successive weft yarns (11-14); (15-18) of each group in the upper backing fabric (19) are interlaced over, under, under and over the tension warp yarn (2), (7) respectively, and in the lower backing fabric (20) under, under, over and over the tension warp yarn (4), (9) respectively. Because of this in the upper velours fabric pile yarn tufts standing upright will be obtained and in the lower velours fabric the pile yarn tufts will be oriented slantwise to the right.

[0062] In figure 19 two warp yarn systems provided next to one another are shown in a respective schematic cross-section of a face-to-face shadow velours fabric. In each cross-section an upper (19) and a lower backing fabric (20), woven above one another by using a method according to the present invention is shown. The binding warp yarns have not been represented. For the pile yarns (1), (6) a 3/6-W-weave is used. After cutting through the pile yarns (1),(6) between these backing fabrics (19), (20), on the faces of the backing fabrics facing each other differently oriented pile yarn tufts will be obtained.

[0063] The weave levels of the first (11), (15) and third weft yarns (13), (17) of each group of weft yarns (11-13), (15-17) with respect to the tension warp yarns (2), (7), (4), (9) determine the orientation of the pile yarn tufts standing out between these weft yarns on the finished velours fabrics, on the basis of these weave levels it can be deduced from figure 19 that the face-to-face fabric

- has a first part (31) where on overlapping parts of these fabrics pile yarn tufts slantwise to the left will be obtained,

- has a second part (32) where on overlapping parts of the upper and lower fabrics pile yarn tufts oriented slantwise to the left and slantwise to the right respectively will be obtained,

- has a third part (33) where on overlapping parts of the upper and the lower fabric pile yarn tufts standing upright will be obtained,

- has a fourth part (34) where on overlapping parts of the upper and the lower fabric pile yarn tufts standing upright and oriented slantwise to the left respectively will be obtained,

- has a fifth part (35) where on overlapping parts of the upper and the lower fabric pile yarn tufts oriented slantwise to the right will be obtained,

- and has a sixth part (36) where on overlapping parts of the upper and the lower fabric pile yarn tufts oriented slantwise to the right and slantwise to the left respectively will be obtained,

[0064] Each of the shadow velours fabrics thus obtained has pile yarn tufts standing upright, pile yarn tufts oriented slantwise to the left and pile yarn tufts oriented slantwise to the right. With this differently oriented pile

yarn tufts, pole zones with a different aspect may be formed. With these pole zones any design, pattern or figure or form or sign may be made visible in the fabric. Thus, it is possible to weave shadow fabrics with a pile face in which pile zones form one or more numerals or characters or a logo.

[0065] Because different pile zones may overlap, the figures in both fabrics may be determined independently of one another. The invention further also presents the particular advantage to enable the weaving of two shadow velours fabrics at the same time, having an identical figure, which is asymmetrical with respect to the central axis of the fabric as is mostly the case for numerals or characters or logos.

[0066] In order to form different figures on both fabrics, and more particularly if two identical fabrics should be obtained for asymmetrical figures, it is possible first to make a card design on which it can be seen which orientation the pile yarn tufts should have on the pile faces situated above one another, in order, in doing so, to determine the weave to be used in a next step.

[0067] To illustrate such a method it will be explained hereafter, with reference to the figures 20, 21 and 22, how a card design is made for weaving face-to-face two shadow velours fabrics having a pile face in which the numeral "2" can be distinguished.

[0068] The card design is a grid, each box of which corresponds to a crossing of two warp yarn systems situated next to one another and a number of weft yarns. In the different boxes or grid points of this grid is indicated by means of a colour agreed upon, which orientation is to be obtained in that particular place of the fabric. In the example there are two different orientations in the fabric: for instance pile yarn tufts directed slantwise to the left and directed slantwise to the right.

[0069] The two possible orientations are each associated with a different colour, for instance colour A for orientation to the left and colour B for orientation to the right. A dominant orientation is chosen, for instance orientation to the left. Further a first auxiliary card design (40) is made for the lower velours fabric, as represented in figure 20. In this card design, the boxes with colour B (orientation to the right) form the numeral "2", whereas all other boxes are of the colour A (dominant orientation to the left).

[0070] Then a second auxiliary card design (41) is made for the upper velours fabric, in which the numeral "2" is drawn as the mirror image with respect to the fell of the fabric (see figure 21). For the dominant orientation to the left the colour A is used again. The mirror image, which has to be formed by pile yarn tufts with an orientation to the right, is indicated by a colour C not yet used.

[0071] Then the second auxiliary card design (41) is placed on the first auxiliary card design (40).

[0072] Anywhere the dominant orientation to the left is found in both fabrics, colour A is maintained in the final card design (42). The final card design is represented in figure 22. The colour A is associated with a weave

causing an orientation to the left in both fabrics. This may be the weave of figure 2 or of figure 11 for instance.

[0073] Anywhere a box of colour C (at the right in the upper fabric) is overlapping a box of colour B (at the right in the lower fabric), colour C is replaced by a colour D not yet used in the final card design (42). Colour D in the card-design (42) is associated with a weave that causes pile yarn tufts oriented to the right in both upper and lower fabric. This is, for instance, the weave of figure 3 or the weave of figure 12.

[0074] Anywhere the boxes of colour B were not covered by boxes of colour C, colour B is maintained on the final card design (42). In the upper fabric the dominant orientation to the left may be maintained, whereas the orientation to the right for the figure should be obtained in the lower fabric. Therefore in the card design (42) the colour B is associated with a weave causing an orientation to the right in the lower fabric, and an orientation to the left in the upper fabric. This, for instance, may be the weave of figure 4 or of figure 13.

[0075] Anywhere a box of the colour C is not situated over a box of colour B, the colour C is maintained in the final card design (42). In these places in the lower fabric, the predominant orientation to the left may be maintained, whereas in the upper fabric the figure forming orientation to the right should be obtained. Therefore in the card design (42) the colour C is associated with a weave causing an orientation to the left in the lower fabric, and an orientation to the right in the upper fabric. This may be the weave of figure 5 or of figure 14. The final card design (42) with boxes of the colours A, B and C is shown in figure 22.

[0076] When three orientations should be obtained in the shadow velours fabrics, there are nine different combinations of orientations possible for the fabrics to be woven face-to-face. Therefore, nine colours should be used in the final card design. When making such a card design, the first thing to do, is to make a first auxiliary card design for the lower fabric, in which the dominant orientation is indicated by a colour A and the two other orientations by the colour B and by the colour C. In a second auxiliary card design the mirror image for the upper fabric is represented. In this second auxiliary card design, the colour A is likewise chosen for the dominant orientation. For the two other figure forming orientations the colour D and the colour E are used respectively.

[0077] Then the second auxiliary card design will be placed on the first auxiliary card design and on that basis four preparing card designs will be made. In the preparing card designs, the two overlapping figures are represented each time on the dominant background orientation, using colour A.

In the first preparing card design a colour F is attributed to the boxes where colours B and D are overlapping. In the second preparing card design a colour G is attributed to the boxes where colours B and E are overlapping. In the third preparing card design a colour H is attributed to the boxes where colours C and D are overlapping,

and in the fourth preparing card design a colour I is attributed to the boxes where colours C and E are overlapping. Finally, the nine colours (A to I) of the four preparing card designs are transferred to one final card design. Then a weave is associated with each colour A to I), resulting in the orientations required in the upper and lower fabrics. To that effect, a choice is made from the weaves of the figures 1 to 9 or of the weaves of the figures 10 to 18. With this method coloured weft yarns may also be used as is known from the present state of the art.

[0078] This method makes it possible to produce shadow velours fabrics by applying the face-to-face weaving technique, the upper and lower fabrics having correctly readable characters, numerals and logos as figure drawings in the pile face. It is understood that this patent protection also applies to methods where only one card design might be made for one part and the operations described might be automated by means of a computer system and software and by the input of suitable instructions. It is likewise understood that this patent protection also applies to shadow velours fabrics manufactured according to this method.

Claims

1. Method for face-to-face weaving of shadow velours fabrics where two backing fabrics (19), (20) are woven above one another, when the pile yarns (1), (6) are interlaced alternately in the one and in the other backing fabric and then cut through between the backing fabrics (19), (20), so that two velours fabrics are woven with pile forming pile yarn tufts having a pre-determined orientation on the pile faces, facing each other, and so that each velours fabric has at least one first pile zone and at least one second pile zone, the pile yarn tufts of which have a first and a second orientation respectively, which is different, in order to form a pre-determined figure on each velours fabric, **characterized in that** the orientation of the pile yarn tufts is determined in such a manner that on the faces of the velours fabrics facing each other, at least one pile zone of the one velours fabric and a least a second pile zone of the other velours fabric are overlapping, so that the projection of each figure on the opposite pile face produces a figure, which is different from the figure formed on the other pile face;
2. Method for face-to-face weaving of shadow velours fabrics according to claim 2 **characterized in that** the orientation of the pile yarn tufts is determined in such a manner that the projection of each figure on the opposite pile face produces a figure that is the mirror image of the figure formed on that other pile face, with respect to the axis, which is parallel with the fell of the fabric.
3. Method for face-to-face weaving of shadow velours fabrics according to claim 1 or 2, **characterized in that** each shadow velours fabric moreover has at least also one third pile zone, the pile yarn tufts of which have a third orientation that is different from the first and second orientations in order to form, together with each first and second pile zone, a pre-determined figure on each velours fabric, and **in that** the orientation of the pile yarn tufts is determined in such a manner that at least one first pile zone and at least one third pile zone overlap and/or at least one second pile zone and at least one third pile zone are overlapping on the velours fabrics facing each other.
4. Method for face-to-face weaving of shadow velours fabrics according to anyone of the preceding claims, **characterized in that** beforehand a representation (42) is made of the pile faces of the velours fabrics situated above one another, in which in different places of that representation it is symbolically indicated which orientation the pile yarn tufts should have in the corresponding places of the upper and lower velours fabrics, situated above one another, in order to form the pre-determined figures.
5. Method for face-to-face weaving of shadow velours fabrics according to claim 4, **characterized in that** the said schematic representation is a card design (42) with symbolic indications (A to D) by means of a colour code.
6. Method for face-to-face weaving of shadow velours fabrics according to claim 4 or 5, **characterized in that** in the said representation (42), four different symbolic indications (A), (B), (C), (D) are used, in the following situations respectively:
 - a. If the pile yarn tufts in the upper and the lower fabric should have a same first orientation,
 - b. If the pile yarn tufts in the upper velours fabric should have a first orientation and those in the lower velours fabric should have a second orientation,
 - c. If the pile yarn tufts in the upper velours fabric should have a second orientation and those in the lower velours fabric should have a first orientation,
 - d. If the pile yarn tufts in the upper velours fabric and in the lower velours fabric should have a same second orientation,
7. Method for face-to-face weaving of shadow velours fabrics according to claim 4 or 5, **characterized in that** in the said representation (42) nine different symbolic indications (A to D) are used, in the following situations respectively:

- a. If the pile yarn tufts in the upper and the lower fabric should have a same first orientation,
- b. If the pile yarn tufts in the upper and the lower fabric should have a same second orientation,
- c. If the pile yarn tufts in the upper and the lower fabric should have a third orientation, 5
- d. If the pile yarn tufts in the upper velours fabric should have a first orientation and in the lower velours fabric a second orientation,
- e. If the pile yarn tufts in the upper velours fabric should have a first orientation and in the lower velours fabric a third orientation, 10
- f. If the pile yarn tufts in the upper velours fabric should have a second orientation and in the lower velours fabric a first orientation. 15
- g. If the pile yarn tufts in the upper velours fabric should have a second orientation and in the lower velours fabric a third orientation.
- h. If the pile yarn tufts in the upper velours fabric should have a third orientation and in the lower velours fabric a first orientation. 20
- i. If the pile yarn tufts in the upper velours fabric should have a third orientation and in the lower velours fabric a second orientation. 25
8. Method for face-to-face weaving of shadow velours fabrics according to anyone of the preceding claims, **characterized in that** the said different orientations are an orientation standing upright, an orientation slanting to the left in the warp direction or an orientation slanting to the right in the chain direction. 30
9. Method for face-to-face weaving of shadow velours fabrics according to anyone of the claims 4 to 8, **characterized in that** a weave is associated with each symbolic indication (A to D) in the said representation (42), which determines the course of the warp chains (1-5), (6-10) of at least one warp yarn system comprising a pile yarn (1), (6), with respect to a number of successively inserted weft yarns (11-14), (15-18), in order to weave two backing fabrics (19), (20) from warp yarns (1-5), (6-10) and weft yarns (11-14), (15-18) and giving the pile yarn tufts of the said pile yarn (1), (6) in these backing fabrics (19), (20) the orientations indicated by the symbolic indication (A to D) concerned. 35 40 45
10. Method for face-to-face weaving of shadow velours fabrics according to anyone of the preceding claims, **characterized in that** a number of warp yarn systems is provided comprising a pile yarn (1), (6) and for each velours fabric a tension warp yarn (2), (4); (7), (9) and a binding warp yarn (3), (5); (8), (10), **in that** weft yarns (11-13), (15-17) are inserted between the yarns (1-5), (6-10) of each warp yarn system, so that two backing fabrics (19), (20) are woven with respective tension warp yarns (2), (7); (4), (9) and weft yarns (11-13), (15-17) interlaced by binding warp yarns (3), (5); (8), (10), whereas pile yarns (1), (6) are interlaced in the upper backing fabric (19) alternately over a group of three successive weft yarns (11-13) and over a group of three successive weft yarns (14-17) in the lower backing fabric (20), using a 3/6-W-weave, and are running to the other backing fabric, from each backing fabric (19), (20) between the third weft yarn (13), (17) of a group and the first weft yarn (11), (15) of the next group, and **in that** for each warp yarn system the respective positions of the weft yarns (11-13), (15-17) of each group with respect to the tension warp yarns (2), (7); (4), (9), for each velours fabric are chosen from the following possibilities in function of the orientations desired for the pile yarn tufts:
- a. in order to obtain pile yarn tufts standing upright in the upper and the lower velours fabric: positions over, under and over in the upper velours fabric, and positions under, over and under in the lower velours fabric;
- b. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left in the upper and the lower velours fabric: positions under, under and over in the upper velours fabric, and positions over, over and under in the lower velours fabric;
- c. in order to obtain an orientation of the pile yarn tufts directed slantwise to the right in the upper and the lower velours fabric: positions over, under and under in the upper velours fabric, and positions under, over and over in the lower velours fabric;
- d. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left and slantwise to the right respectively in the upper and the lower velours fabric: positions under, under and over in the upper velours fabric, and positions under, over and over in the lower velours fabric;
- e. to obtain an orientation of the pile yarn tufts directed slantwise to the left and slantwise to the right respectively in the upper and the lower velours fabric: positions over, under and over in the upper velours fabric, and positions over, over and under in the lower velours fabric;
- f. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left and standing upright respectively in the upper and the lower velours fabric: the positions under, under and over in the upper velours fabric, and the positions under, over and under in the lower velours fabric respectively;
- g. in order to obtain an orientation of the pile yarn tufts directed slantwise to the right and standing upright respectively in the upper and the

- lower velours fabric: the positions over, under and under in the upper velours fabric, and the positions under, over and under in the lower velours fabric respectively;
- h. in order to obtain pile yarn tufts standing upright and an orientation directed slantwise to the left of the pile yarn tufts respectively in the upper and the lower velours fabric: the positions over, under and over in the upper velours fabric, and the positions over, over and under in the lower velours fabric respectively;
- i. in order to obtain pile yarn tufts standing upright and an orientation directed slantwise to the right respectively of the pile yarn tufts respectively in the upper and the lower velours fabric: the positions over, under and over in the upper velours fabric, and the positions under, over and over in the lower velours fabric respectively;
11. Method for face-to-face weaving of shadow velours fabrics according to anyone of the preceding claims, **characterized in that** a number of warp yarn systems is provided comprising a pile yarn (1), (6) and for each velours fabric a tension warp yarn (2), (4); (7), (9) and a binding warp yarn (3), (5); (8), (10), **in that** weft yarns are inserted between the yarns (1-5), (6-10) of each warp yarn system, so that two backing fabrics (19), (20) are woven with tension warp yarns (2), (7); (4), (9) and weft yarns (11-14), (15-18) interlaced by binding warp yarns (3), (8); (5), (10), while pile yarns (1), (6) are interlaced in the upper backing fabric (19) alternately over a group of four successive weft yarns (11-14) in the upper backing fabric (19) and over a group of four successive weft yarns (15-18) in the lower backing fabric (20), using a 4/8-W-weave and from each backing fabric (19), (20) between the fourth weft yarn (14), (18) of a group and the first weft yarn (11), (15) of the next group are running to the other backing fabric, and **in that** for each warp yarn system the respective positions of the four successive weft yarns (11-14), (15-18) of each group with respect to the tension warp yarns (2), (7); (4), (9), for each velours fabric are chosen from the following possibilities in function of the orientations desired for the pile yarn tufts:
- a. in order to obtain pile yarn tufts standing upright in the upper and the lower velours fabrics: positions over, under, under and over in the upper velours fabric, and positions under, over, over and under in the lower velours fabric;
- b. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left in the upper and the lower velours fabric: positions under, under, over and over in the upper velours fabric, and positions over, over, under and under in the lower velours fabric;
- c. in order to obtain an orientation of the pile yarn tufts directed slantwise to the right in the upper and the lower velours fabric: positions over, over, under and under in the upper velours fabric, and positions under, under, over and over in the lower velours fabric;
- d. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left and slantwise to the right respectively in the upper and the lower velours fabric: positions under, under, over and over in the upper velours fabric, and positions under, under, over and over in the lower velours fabric;
- e. in order to obtain an orientation of the pile yarn tufts directed slantwise to the right and slantwise to the left respectively in the upper and the lower velours fabric: positions over, over, under and under in the upper velours fabric, and positions over, over, under and under in the lower velours fabric;
- f. in order to obtain an orientation of the pile yarn tufts directed slantwise to the left and standing upright respectively in the upper and the lower velours fabric: the positions under, under, over and over in the upper velours fabric, and the positions under, over, over and under in the lower velours fabric respectively;
- g. in order to obtain an orientation of the pile yarn tufts directed slantwise to the right and standing upright respectively in the upper and the lower velours fabric: the positions over, over, under and under in the upper velours fabric, and the positions under, over, over and under in the lower velours fabric respectively;
- h. in order to obtain pile yarn tufts standing upright and an orientation of the pile yarn tufts directed slantwise to the left respectively in the upper and the lower velours fabric: the positions over, under, under and over in the upper velours fabric, and the positions over, over, under and under in the lower velours fabric respectively;
- i. in order to obtain pile yarn tufts standing upright and an orientation of the pile yarn tufts directed slantwise to the right respectively in the upper and the lower velours fabric: the positions over, under, under and over in the upper velours fabric, and the positions under, under, over and over in the lower velours fabric respectively;
12. Method for face-to-face weaving of shadow velours fabrics according to claim 9, **characterized in that** with each symbolic indication (A to D) in the said representation (42) a weave is associated, having one of the possibilities according to claim 13 or a

weave having one of the possibilities of claim 14, in which for these weaves that option is chosen, which provides the orientations of the pile yarn tufts indicated by the symbolic indication (A to D) concerned.

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13. Method for face-to-face weaving of shadow velours fabrics according to anyone of the claims 4 to 12, **characterized in that** the said representation (42) is made up by:

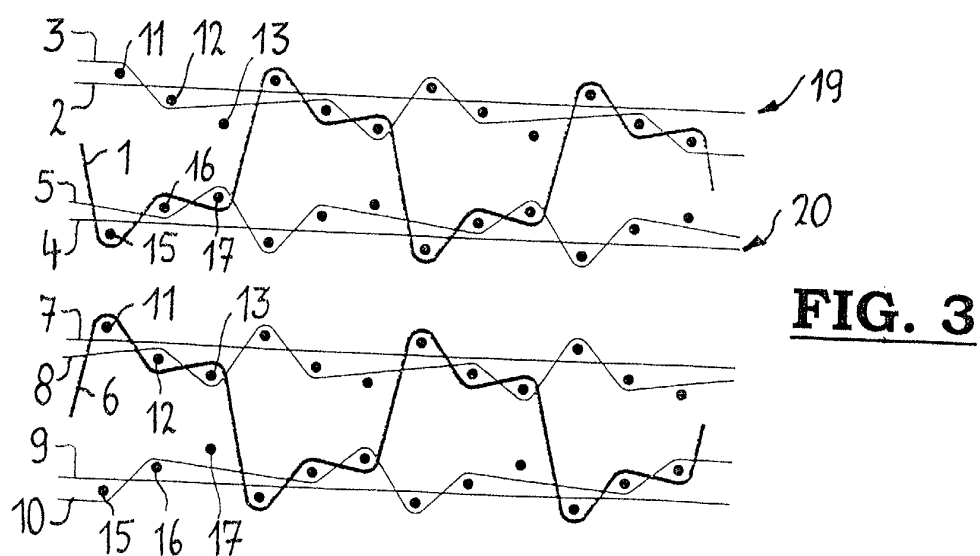
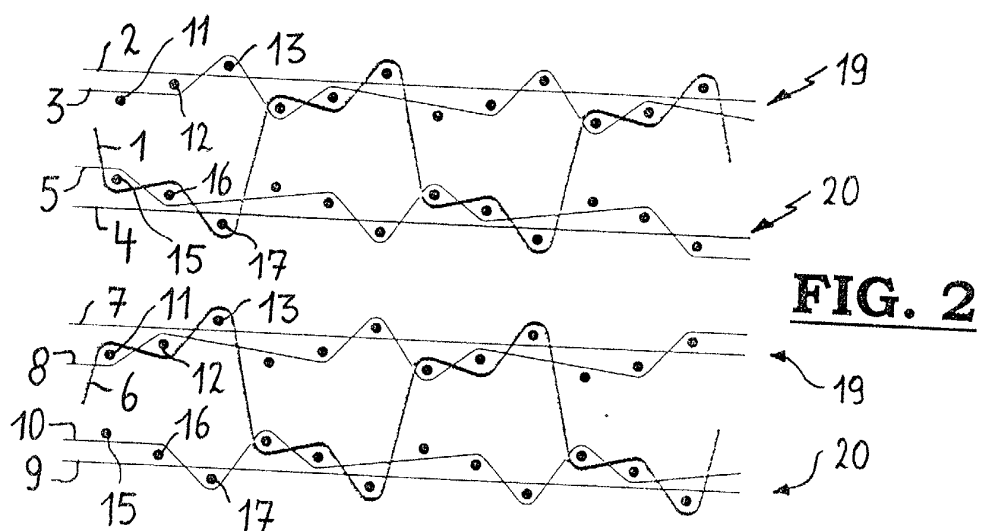
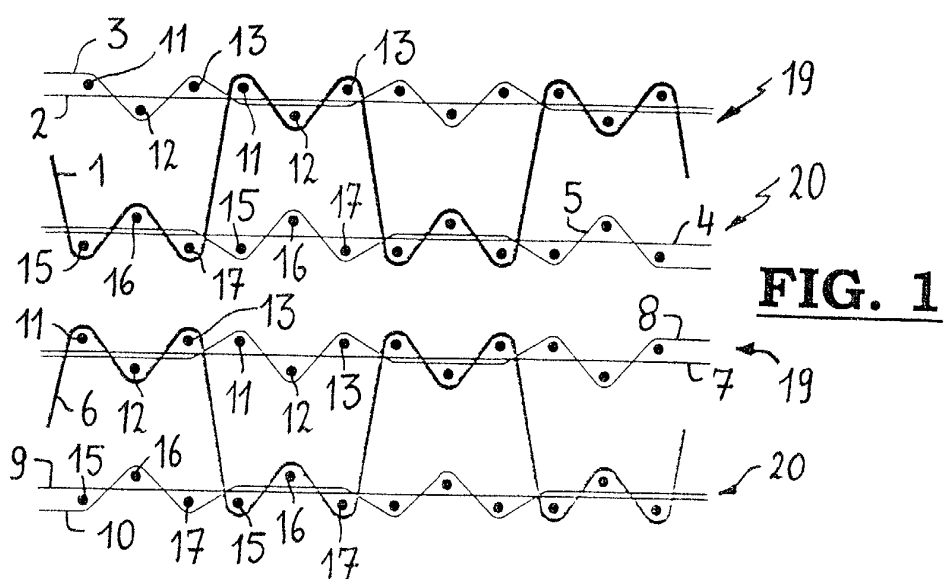
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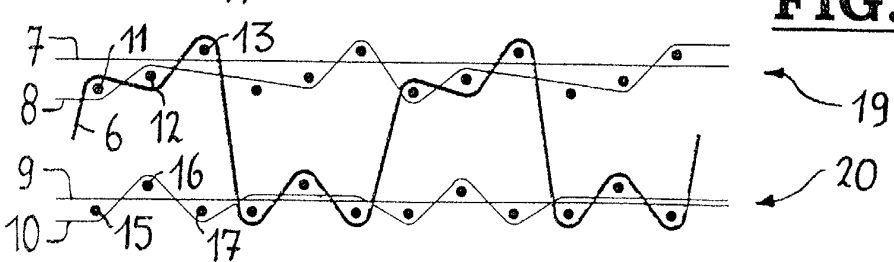
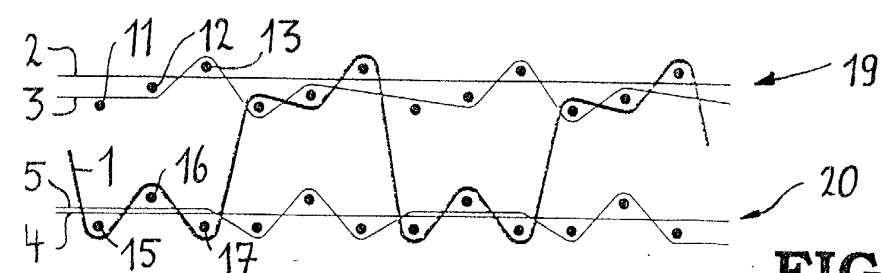
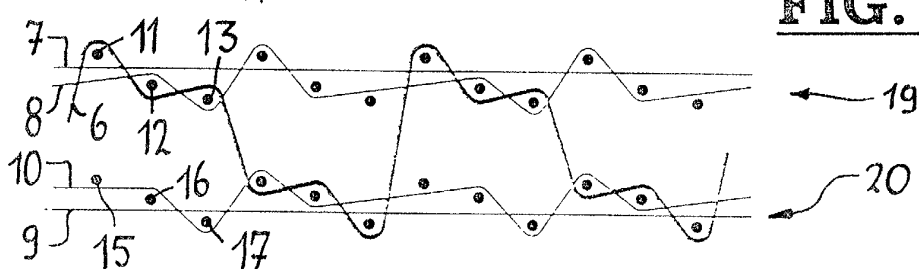
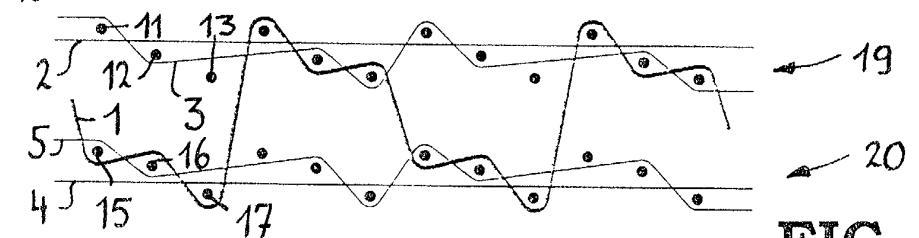
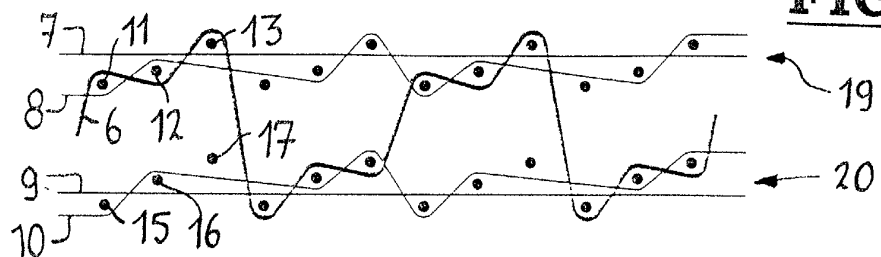
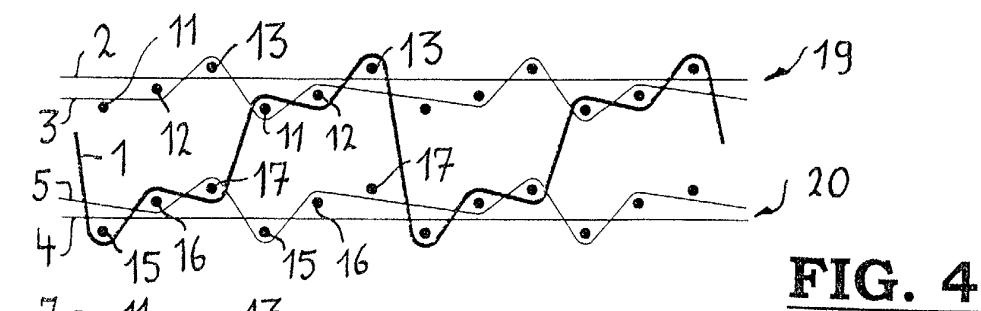
- making a first auxiliary representation (40) of the pile face of the one velours fabric, in which in various places of that representation it is symbolically indicated which orientation the pile yarn tufts in the corresponding places of the pile face should have in order to form the pre-determined figure on the one velours fabric; 15
- making a second auxiliary representation (41) of a pile face, which is the mirror image of the pile face of the one velours fabric, with respect to an axis coinciding with a fell of the fabric, in which in various places of that representation it is indicated symbolically which orientation the pile yarn tufts should have in the corresponding places of that pile face in order to form the mirror image, 20 25
- placing above one another or representing the two auxiliary representations (40), (41) on one another and on the basis of this arrangement or representation to determine which orientations the pile yarn tufts should have in the corresponding places situated above one another of the upper and lower velours fabrics, and 30
- applying a different symbolic indication to the said representation (42) for each different combination of orientations of the pile yarn tufts to be realized above one another. 35

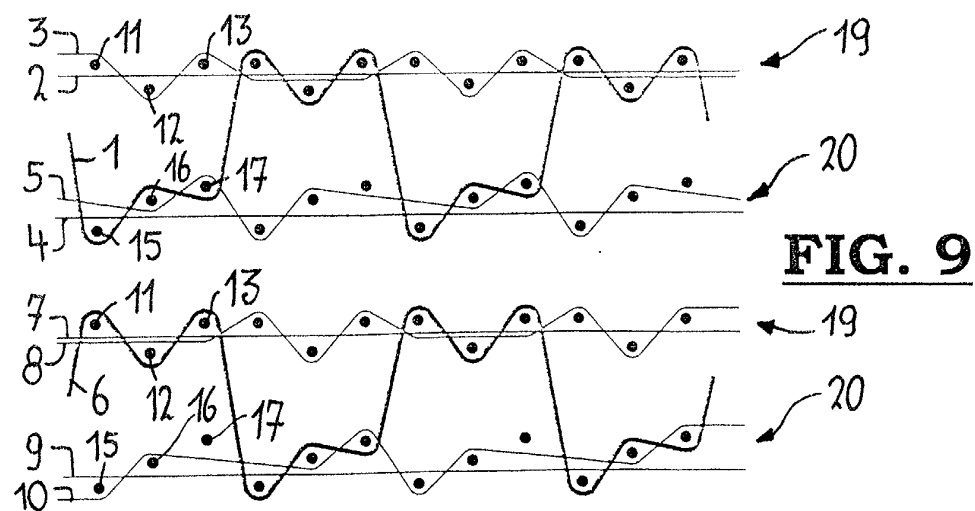
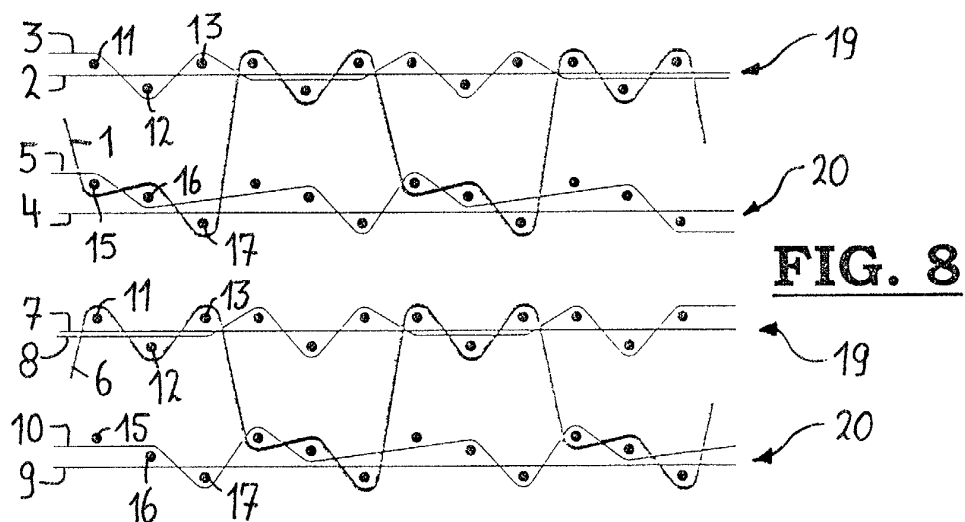
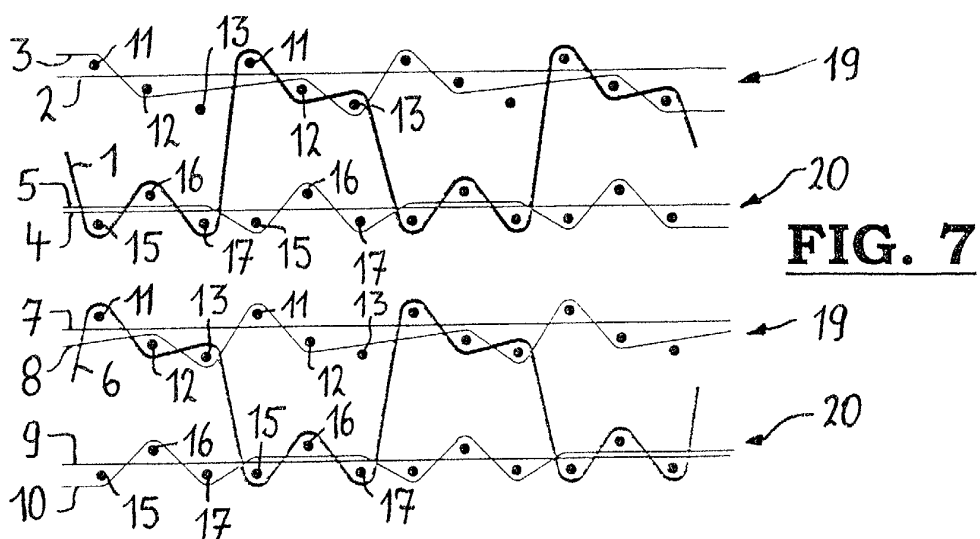
14. Method for face-to-face weaving of shadow velours fabrics according to anyone of the claims 2 to 13, **characterized in that**, by means of a computer, on the basis of orientations of pile yarn tufts on the one fabric, the orientations of the pile yarn tufts on the other fabric can be determined automatically, which are needed to obtain on the fabrics the respective figures, which when projected on the opposite pile face will produce the mirror image of the figure formed on the other pile face. 40 45

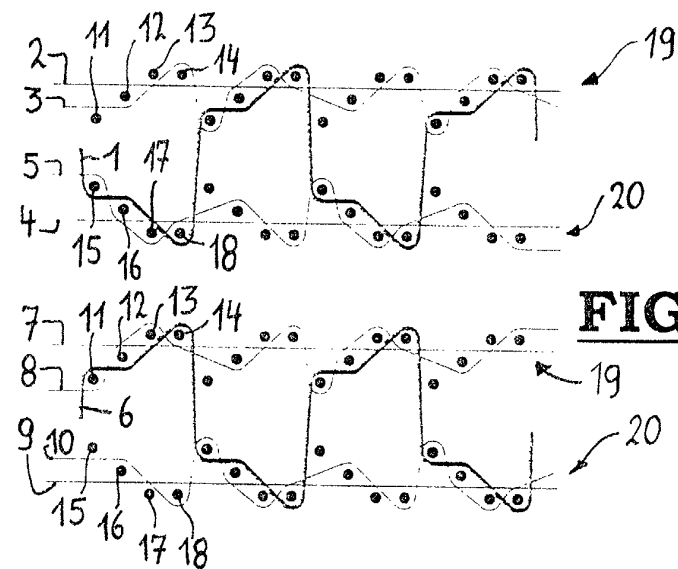
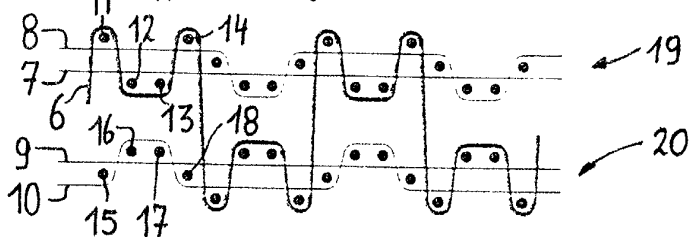
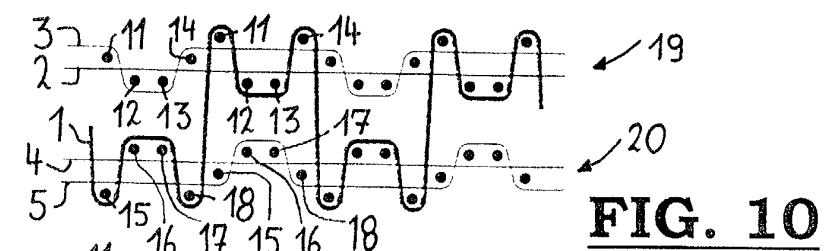
15. Method for face-to-face weaving of shadow velours fabrics according to claims 4 and 14, **characterized in that** the said representation (42) is made automatically by means of a computer on the basis of an auxiliary representation (40), (41) of the pile face of one of the two fabrics, in which in various places of this auxiliary representation (40), (41) it is symbolically indicated which orientation the pile yarn tufts in the corresponding places of the pile face 50 55

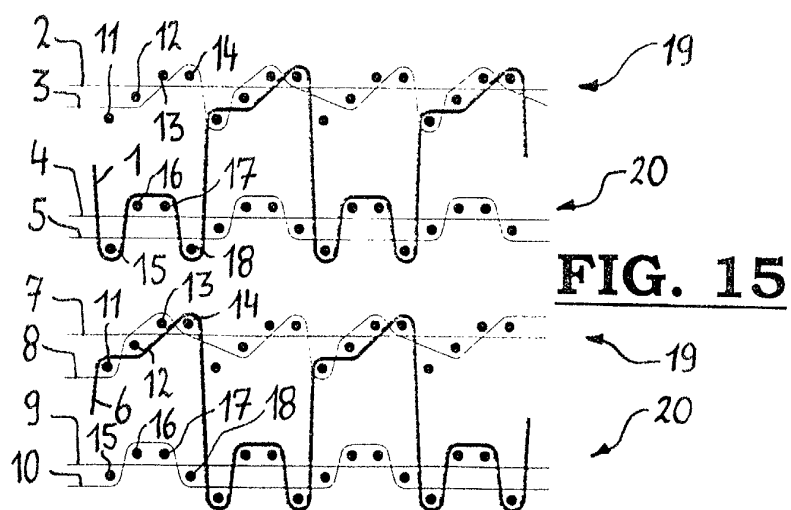
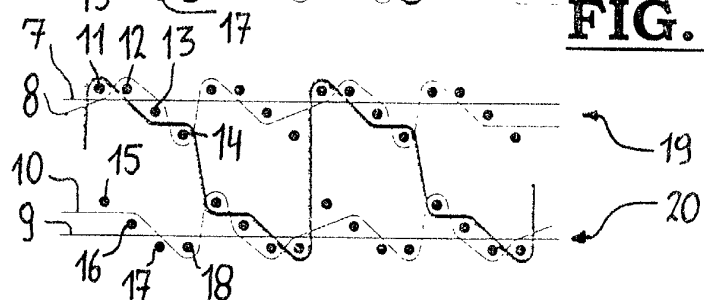
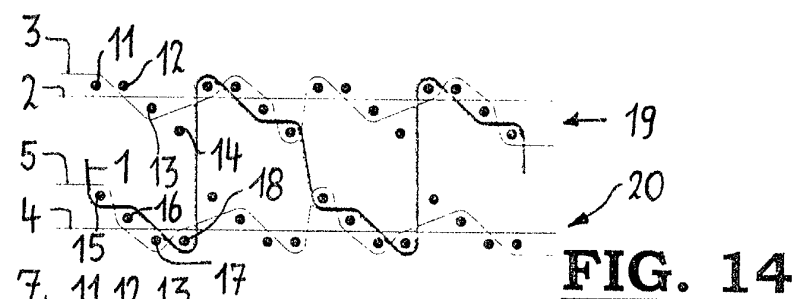
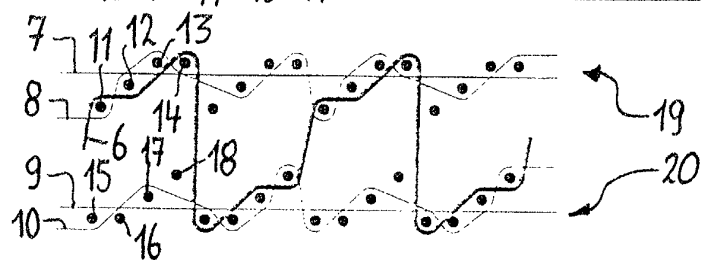
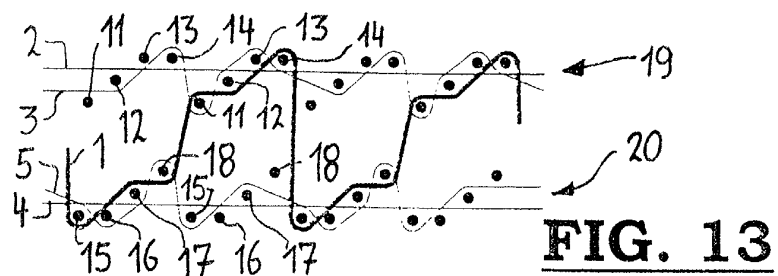
should have in order to form the pre-determined figure on that velours fabric.

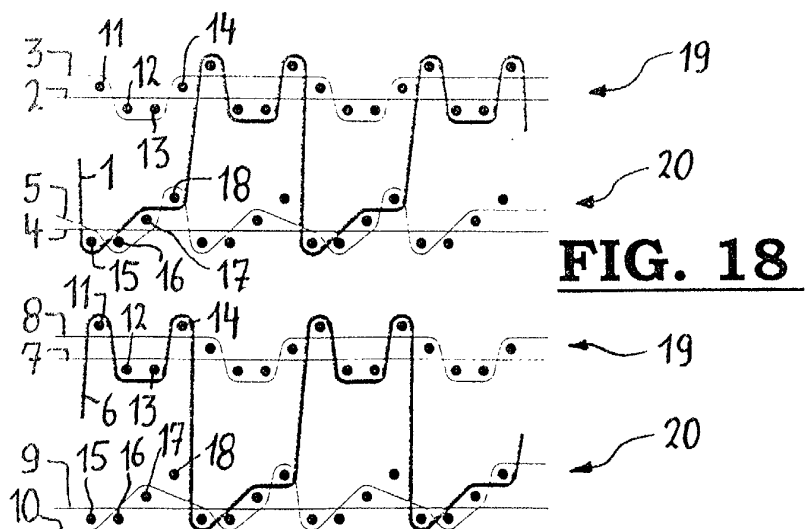
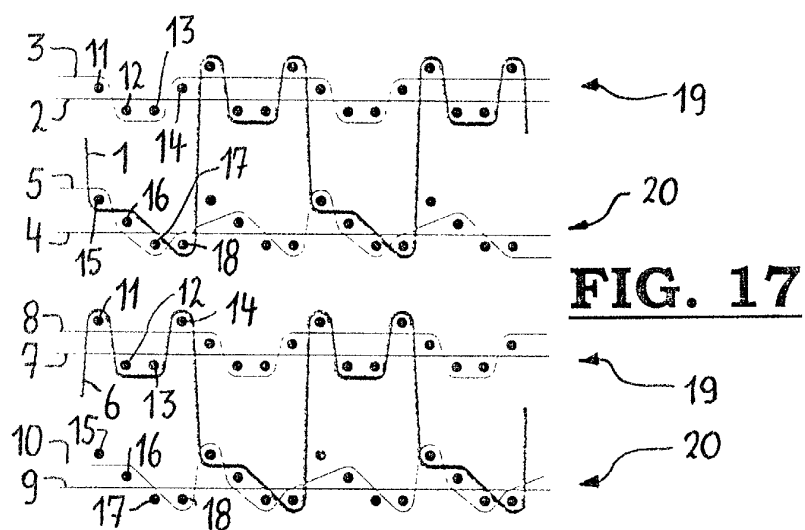
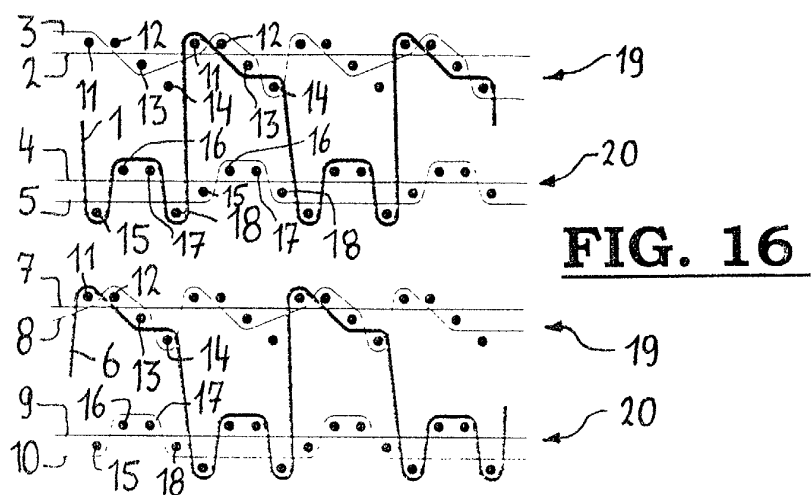


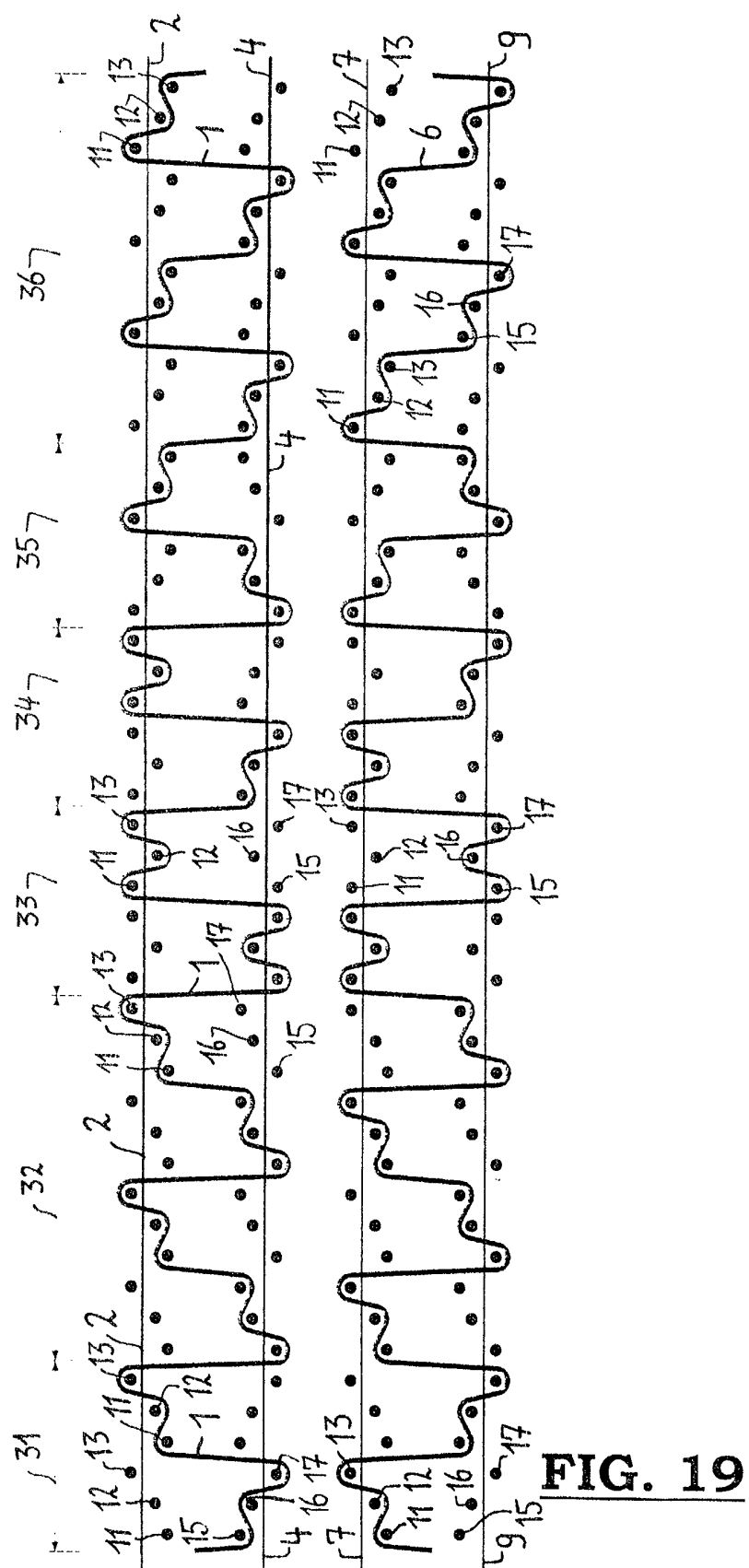












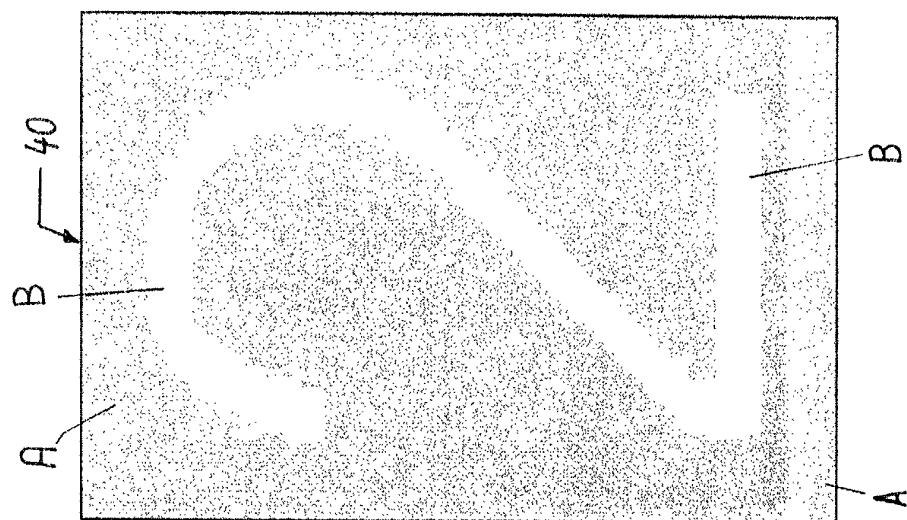


FIG. 20

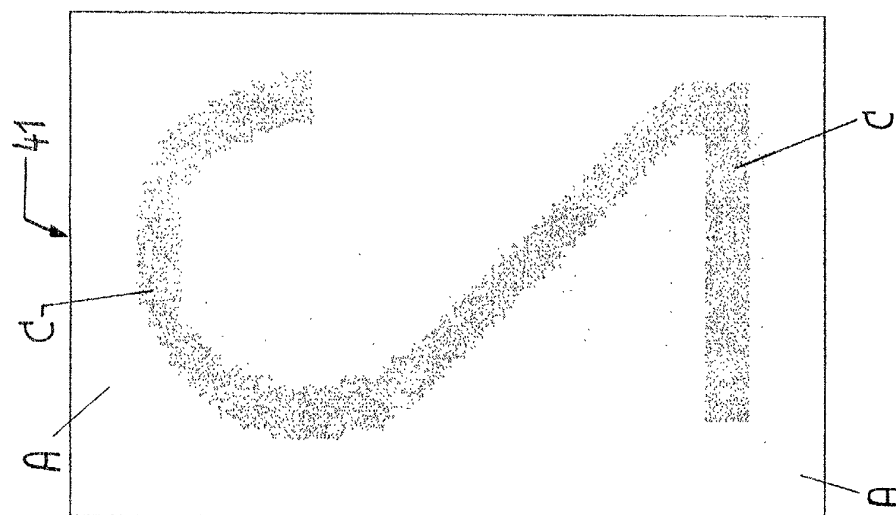


FIG. 21

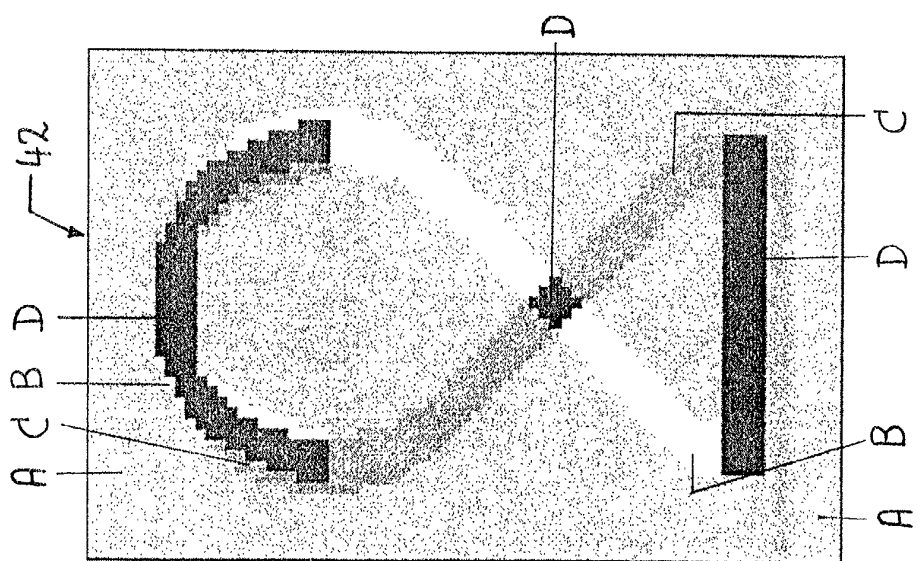


FIG. 22

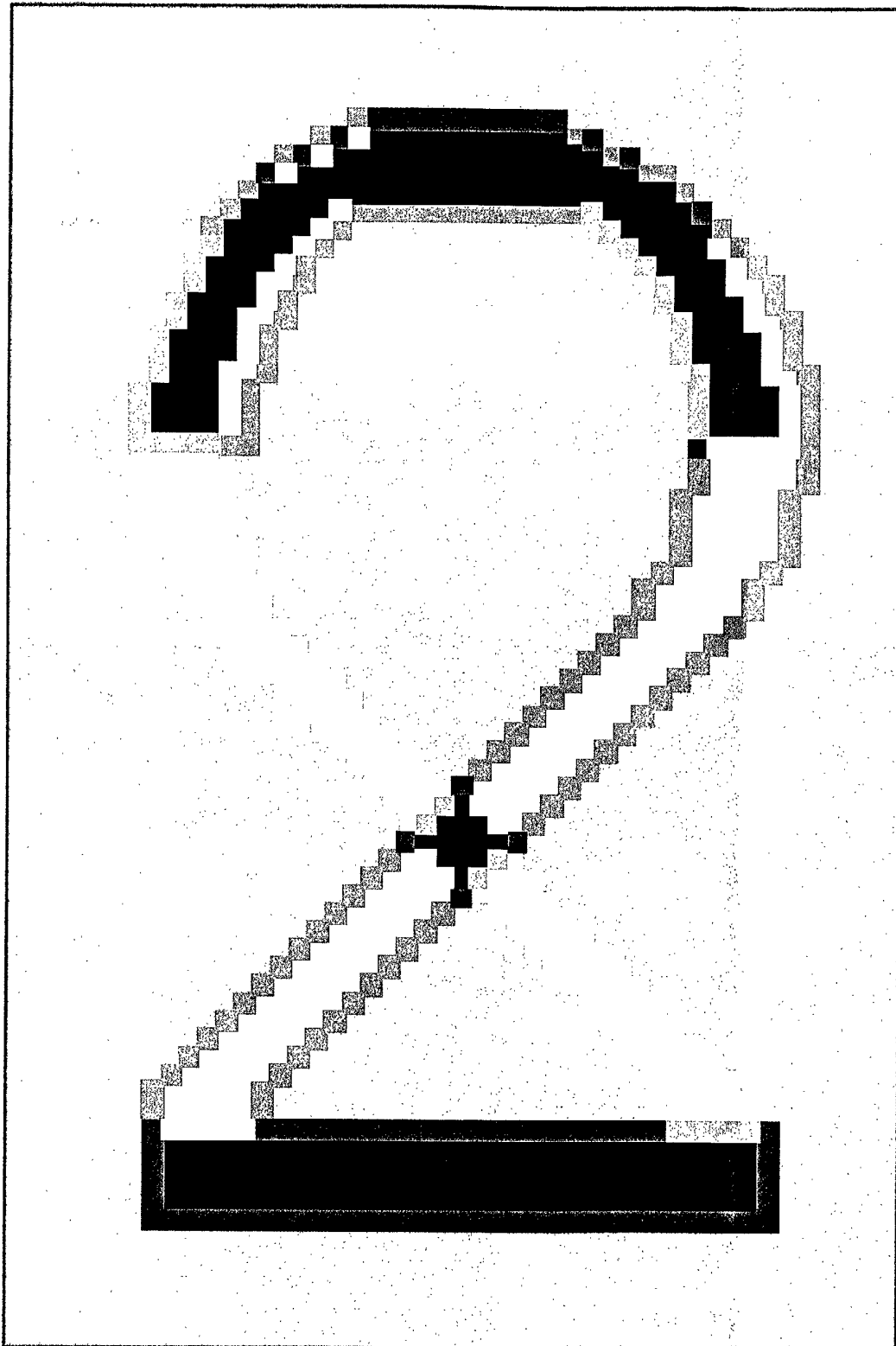


FIG. 23



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 07 6421

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			D03D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 August 2002	Examiner Rebiere, J-L
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30-08-2002

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