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(54) Double lift open shed Jacquard

(57) In a double lift open shed Jacquard machine (4) for a double shed loom (1) comprising a reading-in mechanism (8) for program carriers (12) and a shed forming mechanism with double roller means (25) which after each reading-in operation can be positioned in three positions, a respective harness (5) and two control units comprising for example thrust needles (11), main needle (18) and hooks (20), operatively associated with each double roller means (25) and arranged in rows in juxtaposed relationship, in superposed relationship and in succession in the warp direction, the distribution of the control units (11, 18, 20) in relation to the width and the longitudinal direction of the machine is such that the number of juxtaposed rows of control units is substantially reduced, preferably halved, in relation to the number of juxtaposed rows of control units in a conventional Jacquard machine of that kind while the number of rows of control units arranged in succession in the longitudinal direction of the Jacquard machine (4) is correspondingly increased.

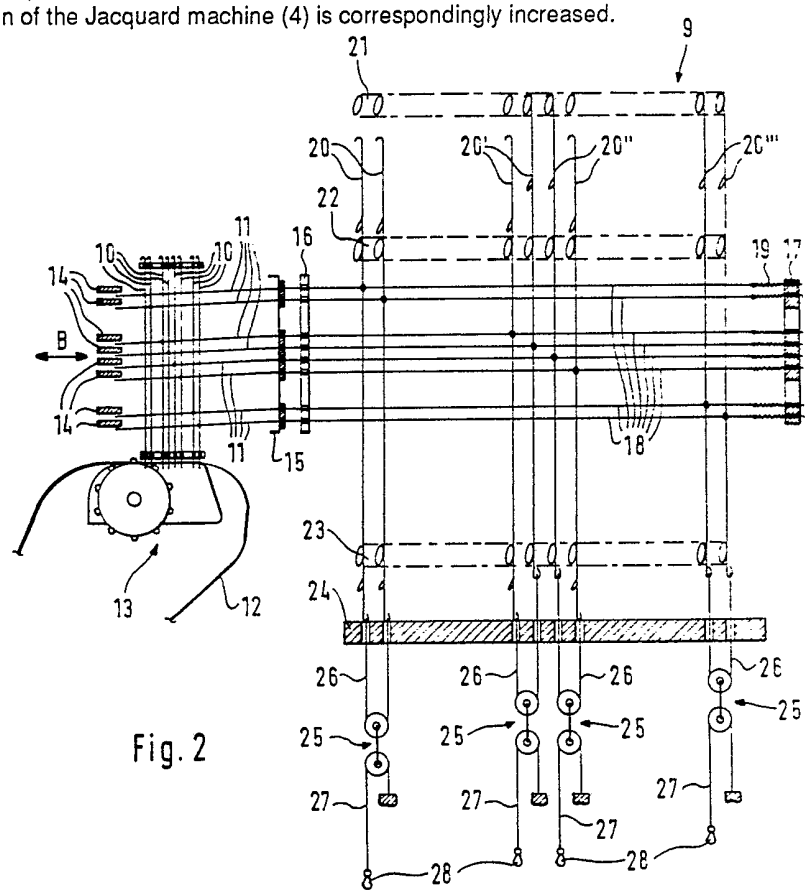

Fig. 2

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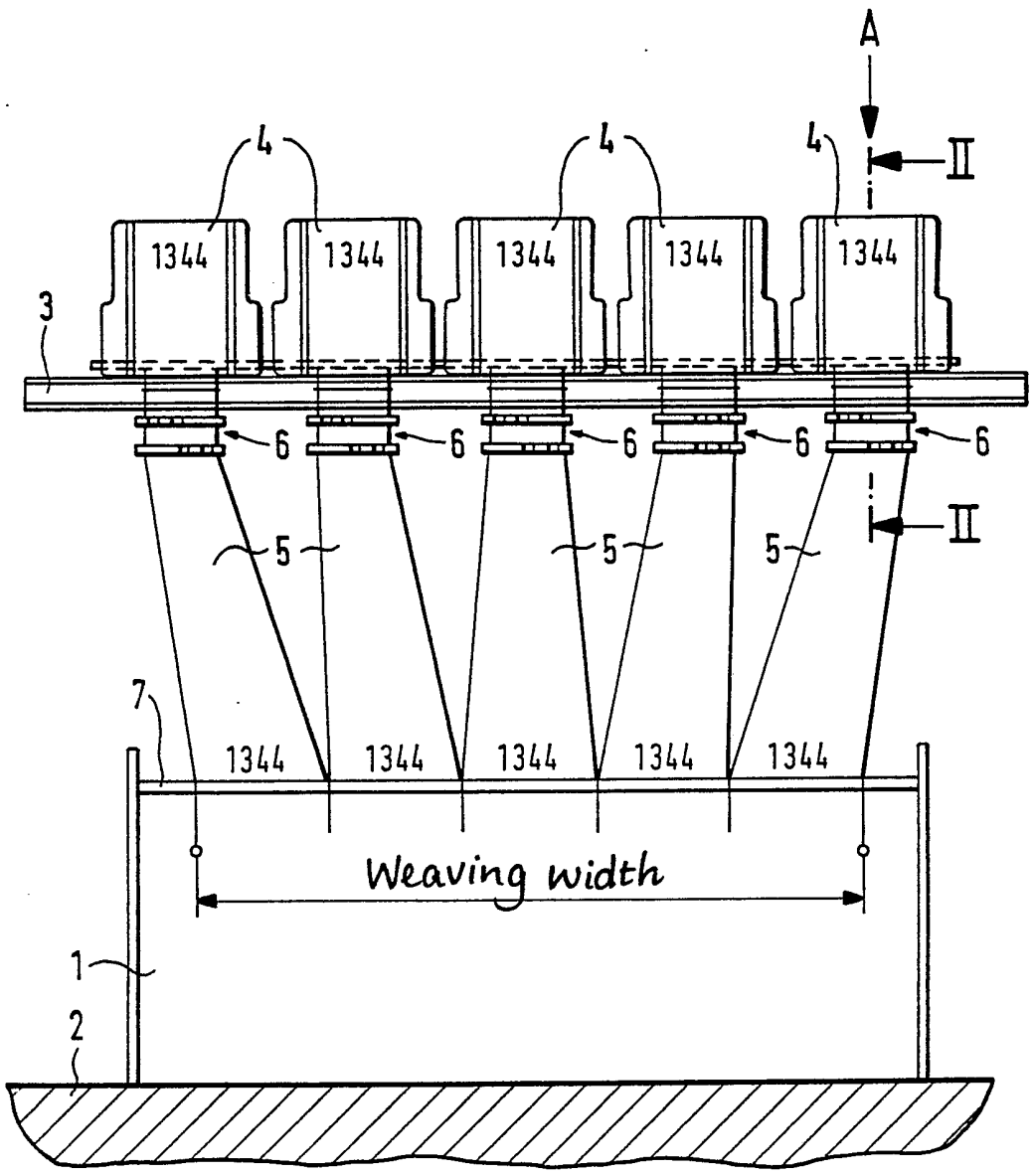

Fig. 1

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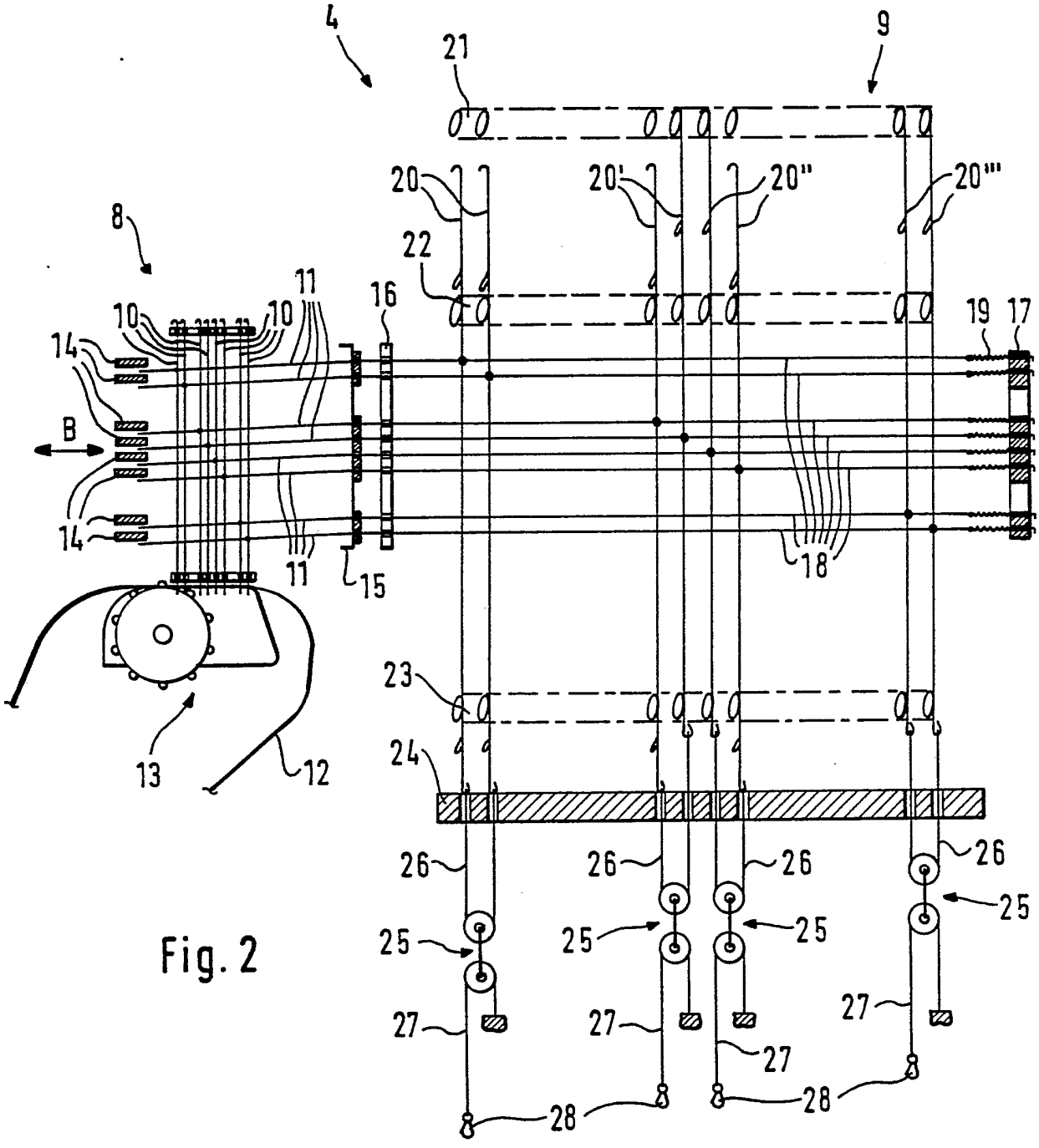

Fig. 2

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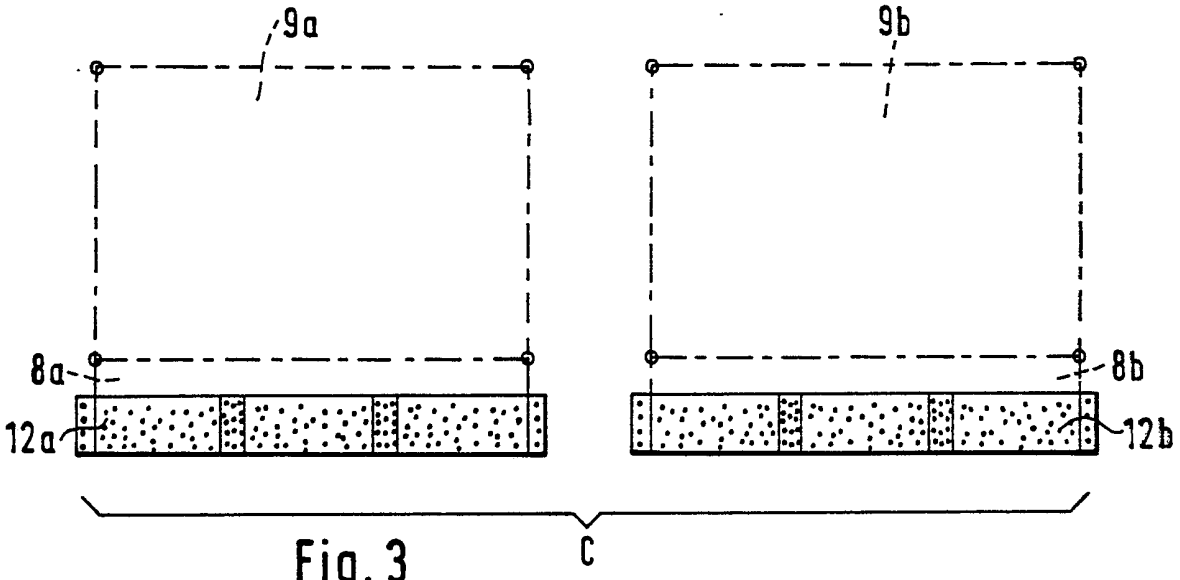

Fig. 3

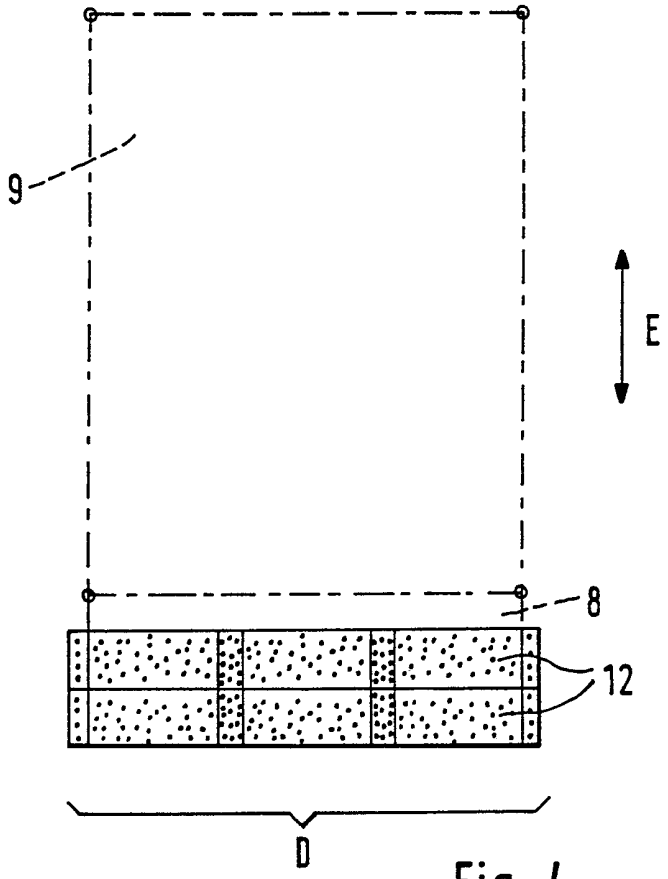

Fig. 4

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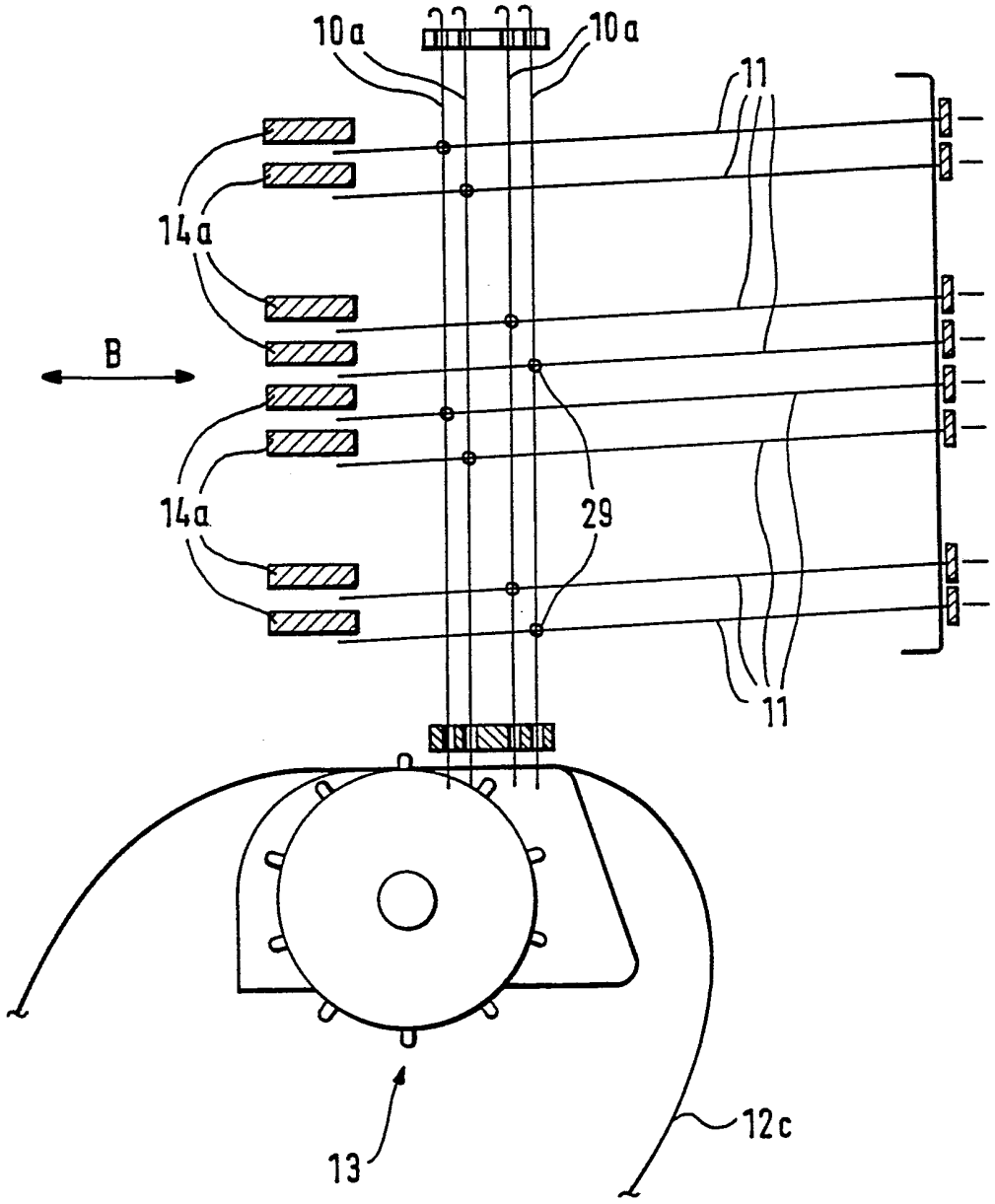

Fig. 5

DOUBLE LIFT OPEN SHED JACQUARD MACHINE

The invention relates to a double lift open shed Jacquard machine for double shed looms.

A double lift open shed Jacquard machine for a double shed loom comprising a read-in mechanism for program carriers and a shed forming mechanism, with double roller assemblies which after each reading-in operation can be positioned in three positions, each with a respective harness arrangement and with two control units which are associated with each double roller assembly and which are arranged in rows one beside the other, one above the other and one behind the other in the warp direction, is disclosed in French patent specification No 1 513 410. In that arrangement, the control units may comprise for example thrust needles, main needles and hooks.

Arrangements of that kind are used for example for producing double nap woven materials such as carpets, plush fabrics or the like, in which an upper woven material and a lower woven material which are joined together by nap or pile warp threads or yarns are woven jointly and then the upper and lower materials are separated by severing so that the severed nap or pile warp yarns or threads then form the nap or pile of the respective woven articles. Such an arrangement can also be used to produce other forms of material such as that which is known as a rod-type material. In a double shed loom, two weft threads or yarns or a weft thread or yarn and a rod element can be picked simultaneously. For that purpose the warp threads or yarns must be capable of assuming three positions, namely a bottom shed position, a middle shed position and a

top shed position.

In the case of Jacquard machines as are to be found for example in German patent specifications Nos 502 645 and 574 920, those three positions can be achieved but not individually after each reading-in operation; rather, a plurality of successive lift movements are required to achieve that aim. That gives the disadvantage that the weaving speed which can be achieved is low.

In the double lift open shed Jacquard machine disclosed in French No 1 513 410 as referred to above the warp threads or yarns can be positioned in three positions after each reading-in operation. That arrangement has the above-mentioned double roller assemblies with harness arrangements connected thereto, with each double roller assembly having associated therewith a pair of control units comprising main needles and hooks. The reading-in mechanism of such an apparatus is usually designed for reading in information from punched cards. The punched cards usually have sixteen rows of holes in the longitudinal direction and vary in respect of width. The number of holes across the width of a card is usually 28, 56 or 84. As, in the case of an apparatus as referred to above, two control units are associated with each double roller assembly, when such an arrangement is controlled by means of a conventional punched card in the longitudinal direction, only half the control commands required for producing the control effect are issued. In an endeavour to remedy that situation, in addition to the first punched card, the arrangement can be designed to feed a second corresponding punched card to the read-in mechanism, beside the first punched card, so that the

width of the read-in mechanism and the width of the shed forming mechanism which is disposed downstream thereof have to be doubled. While that gives the required number of control commands, it gives rise to problems in a practical context as, in dependence on the nature and the width of the fabric to be produced, as from a given width of weaving, the control devices consisting of needles and hooks which are required for that purpose, cannot be disposed one beside the other as that would mean that the width of the Jacquard machine with the harness becomes excessive, in relation to the width of weaving, and the angle formed by the harness in extending to the loom becomes so acute, in particular at the outward sides of the harness configuration, that the harness arrangement suffers from an excessively high level of friction. The use of arrangements of the above-indicated kind is limited to small weaving widths for that reason and it is not possible to use such an arrangement to produce substantial widths as are required for example in particular in relation to carpets. Accordingly carpets of greater width are therefore produced for example by using apparatuses as disclosed in German patent specifications Nos 502 645 and 574 920. However, such arrangements suffer from the disadvantage that has already been mentioned above, that the weaving speed that can be achieved is only low.

European patent publication No 0 106 974 discloses a double lift open shed Jacquard machine for a double lift loom, which can solve the problem concerning the width of weaving which can be achieved and the problem concerning the speed of weaving, but that arrangement is restricted in the patterning configurations which can be produced as it

does not afford the possibility of putting the warp threads or yarns into a given one of the three positions in each reading-in operation. That arrangement has only one hook and only one control unit, for each double roller assembly and for each harness arrangement. The point of suspension for the double roller assembly, which is associated with the second hook of a respective pair in an apparatus as disclosed for example in French No 1 513 410, is mounted on a movable bottom member in the apparatus disclosed in the above-mentioned European specification. In that arrangement, all suspension points are disposed on a respective common bottom member which is movable vertically by way of a suitable control device. The bottom member can be moved in a given rhythm by way of an eccentric drive arrangement, thereby providing for the third position in respect of the double roller assemblies and the respective harness arrangement and therewith the respective warp yarns or threads. As however that third position cannot be individually attained in respect of each warp yarn or thread, in each reading-in operation, the patterning options in regard to the material to be produced thereby are thus limited.

According to the present invention, there is provided a double lift open shed Jacquard machine for a double shed loom comprising a reading-in mechanism for program carriers, a shed forming mechanism with double roller means which after each reading-in operation are adapted to be positioned in first, second and third positions, a respective harness and first and second control units operatively

associated with each double roller means and arranged in rows in juxtaposed relationship, in superposed relationship and in succession in the warp direction, the distribution of the control units in relation to the width and the longitudinal direction of the machine being such that the number of juxtaposed rows of control units is substantially reduced in relation to the number of juxtaposed rows of control units in a conventional Jacquard machine of that kind and the number of rows of control units arranged in succession in the longitudinal direction of the Jacquard machine is correspondingly increased.

As will be appreciated hereinafter, the described embodiment of a double lift open shed Jacquard machine affords the option of producing woven materials of virtually any width at a high weaving speed and with unlimited patterning options at the same time, while also being able to provide for more sensitive control in respect of patterning in combination with different effects , as well as being of a more compact design configuration than previous arrangements.

As was noted above, the restrictions on the options in regard to patterning configurations in previous double lift open shed Jacquard

machines were reduced by doubling the reading-in mechanism and the shed forming mechanism in regard to the width thereof, that is to say transversely with respect to the warp direction, with the disadvantage however that that only permitted the production of woven materials of up to a given width.

In comparison therewith, the notion of the present invention is that the required number of rows of control units over the width of the Jacquard machine is to be reduced in such a way that the resulting overall width is compatible with practical situations of operation, and therefore the width of the Jacquard machine is of an acceptable value in relation to the width of weaving. The rows of control units which are not to be disposed in the widthwise direction of the arrangement are thus arranged in succession in the longitudinal direction of the Jacquard machine, utilising appropriate space for that purpose.

A further preferred feature of the invention may provide that, when the reading-in mechanism is in the form of a pre-needle mechanism or control needle mechanism, with successively disposed rows of drop needles and rows of thrust needles which are disposed in superposed relationship, the number of successively disposed rows of drop needles and the superposed rows of thrust needles is doubled in comparison with a conventional control mechanism for producing that effect. While for example in a conventional control needle mechanism, 16 rows of drop needles are disposed one behind the other and 16 rows of thrust needles are disposed one above the other, and that arrangement is to be provided in duplicated form in side-by-side relationship in order to make it

possible simultaneously to read in information from two punched cards which are fed thereto in parallel juxtaposed relationship, the number of rows of successively disposed drop needles in the mechanism according to the invention is 32 while the number of superposed rows of thrust needles is also 32. That configuration permits two punched cards which are fed to the mechanism in succession to be simultaneously read in. Although that configuration gives the same number of items of information which are inputted simultaneously, as in the prior-art machine, the difference is that in the prior-art machine the items of information are read simultaneously from two punched cards which are fed to the reading-in mechanism in side-by-side relationship, thus resulting in the arrangement being of considerable width, whereas in the case of the arrangement according to the invention the items of information are simultaneously read from two punched cards which are fed into the mechanism in succession, being therefore of a dimension corresponding to half the width referred to above.

Another advantage of that arrangement is that the mechanism of the invention requires only one device for suspending and feeding the punched cards.

In another feature of the invention, when the reading-in mechanism is in the form of a control needle mechanism, with successively arranged rows of drop needles and rows, in superposed relationship, of thrust needles, the number of superposed rows of thrust needles is doubled in comparison with a conventional control mechanism for that effect, and the number of successively disposed rows of drop needles corresponds to the

number of successively disposed drop needles in a conventional control mechanism, while first and second thrust needles are associated with each drop-needle , with the drop needles being designed accordingly. That construction can be used to good effect in relation to certain weaving modes in respect of the material to be produced, more specifically for example in regard to a three-weft weaving mode. With that design configuration, the association of first and second thrust needles with each drop needle means that the items of information on the program carrier can be doubled.

In another feature of the invention the thrust needle repulsion effects can be reversed by means of pressing bars or rails which are arranged movably vertically with respect to the thrust needles. The movement thereof can be produced jointly for all the bars or rails. It may also be provided that the bars or rails are arranged to be displaced in a group-wise manner. It may desirably be provided that the bars or rails are designed to be displaceable in different ways, 'positively' or 'negatively', in groups, in regard to the bottom article and in regard to the top article of a double woven material. In that case the reading-in mechanism is designed for reading in the items of information on the same punched card a plurality of times, in succession.

Doubling of the items of information available on a program carrier, and the transmission thereof in 'positive' or 'negative' form, is advantageous if the top article and the bottom article of the double woven material to be produced is to be the same from the point of view of the patterning configuration. In order to produce such articles with the same patterning, 'reverse' control information is required in each case.

That control information, being for example 'positive', which is required at the same time for production of the top article, and the 'negative' control information which is correspondingly required at the same time for the bottom article, or vice-versa, can be produced by the arrangement according to the invention on respective items of information to be found on the information carrier such as a punched card. The option of being able to reverse the repulsion effects in respect of the thrust needles by means of pressing bars or rails which are arranged displaceably vertically with respect to the needles means that, when the same punched card has its information read into the arrangement a plurality of times in succession, the information carried on the punched card can be transmitted with variations to put it into 'positive' or 'negative' form by virtue of the pressing rails or bars being in different positions.

Another preferred feature of the invention can provide that, when the reading-in mechanism is in the form of a control needle mechanism for punched cards, the mechanism is operable for simultaneously reading information from two punched cards which are fed in succession.

Another feature of the invention can provide that the number of juxtaposed rows of control units may approximately correspond to 1/32 of the number of effective control commands which can be simultaneously supplied to the control units by the punched cards. It may be assumed for example that a punched card contains 1344 possible control commands. If, in accordance with the invention, two such punched cards are successively fed to the reading-in mechanism and are then read simultaneously, that gives a total of 2688 control commands which can be supplied simultaneously. If that total number is divided by the number 32, the

result is a figure of 84. That corresponds to the number of rows contained on a given punched card, over the width thereof. The number of juxtaposed rows of control units, in the Jacquard machine, would accordingly be 84. In the case of another punched card, which has 896 possible control commands, the situation would be as follows: 896 x 2 = 1792 control commands. When that figure is divided by 32, that gives a figure of 56 so that in that case the number of juxtaposed rows of control units would be 56.

If, in accordance with the embodiment as outlined above, in comparison with a conventional needle control mechanism of that kind, it is only the number of superposed rows of thrust needles that is doubled, and first and second thrust needles are associated with each suitably designed drop needle, then that gives by way of example the following situation: if the punched card contains 1344 possible control commands, then that figure is also to be doubled in this case (giving the number of 'effective control commands'), as in that case, instead of two punched cards which are supplied in succession and which are read off simultaneously, each having 1344 possible control commands, the number of control commands is doubled by virtue of the association of first and second thrust needles with each of the drop needles.

Embodiments of an arrangement according to the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic front view of a weaving installation with a double shed loom, harness arrangement and Jacquard machine

arrangement,

Figure 2 is a diagrammatic view in section taken along line II-II in Figure 1 through one of the Jacquard machines shown in Figure 1,

Figure 3 is a plan view in the direction indicated by the arrow A in Figure 1 on to a Jacquard machine in accordance with the state of the art in which two punched cards are fed in juxtaposed relationship to the Jacquard machine, with a shed forming mechanism extending over the width thereof, and are read in simultaneously,

Figure 4 is a view corresponding to that shown in Figure 3 but illustrating an embodiment of the Jacquard machine according to the invention in which two punched cards are fed in succession to the shed forming mechanism which is of a narrower configuration than that shown in Figure 3, and are read in simultaneously, and

Figure 5 is a view approximately corresponding to the left-hand half of Figure 2 in respect of a further embodiment of the invention.

Referring firstly to Figure 1, shown therein in diagrammatic form is a double shed loom 1 which is disposed fixedly on a suitable foundation structure 2. Arranged in juxtaposed relationship on a steel frame structure of which only horizontal bearers 3 are shown in Figure 2 for the sake of enhanced clarity of the drawing are double lift open shed Jacquard machines, each of which is identified by reference numeral 4. The upper width of the entire installation is determined by the respective widths of the juxtaposed Jacquard machines 4.

The Jacquard machines 4 operate in the usual fashion to control harnesses which are diagrammatically indicated at 5 in Figure 1 and

which are guided in the upper part of the installation through harness guide means such as grids 6, for example formed by glass bars, while in the region of the loom 1 the harnesses 5 are guided to the weaving width through a harness board 7. The double shed loom can be used to produce double nap woven materials such as carpets, plush fabrics or the like. In such a situation a bottom fabric and a top fabric which are joined together by way of nap or pile warp yarns are jointly woven. After the weaving operation, the top and bottom fabrics are severed in such a way that the severed nap or pile warp yarns then form the nap of the woven material.

The Jacquard machines 4 can provide a control action in such a fashion that the warp yarns or threads which are controlled by way of the harness assemblies 5 can each take up first, second and third positions, namely a bottom shed position, a middle shed position and a top shed position.

Reference will now be made to Figure 2 which is a view in diagrammatic form of a read-in mechanism as identified by 8 and a shed forming mechanism as indicated by 9, for an individual Jacquard machine 4. The read-in mechanism 8 comprises drop needles 10 which are guided by way of suitable guide means (not described in greater detail herein) and thrust needles 11 which are mounted in the needles 10 and which are arranged to extend transversely with respect thereto. Reference numeral 12 in Figure 2 identifies a punched card 12 which is guided and transported by way of a cylinder 13, and moved into positions in front of the needles 10, at the lower ends thereof in Figure 2. If a hole in a

card 12 is in a position below a needle 10, then the needle 10, with the needle 11 associated therewith, will drop down with the bottom end of the needle 10 passing into the hole in the card 12. Then, a horizontal movement of thrust bars 14 in the direction indicated by the double-headed arrow B causes those needles 11 whose associated needles 10 were not disposed at positions in front of respective holes in the respective card 12 to be urged away, towards the right in Figure 2. In the illustrated embodiment the situation is that all the illustrated needles 10 have dropped into respective holes in the card 12 and thus no movement of the needles 11 towards the right in Figure 2 would take place under those circumstances. Reference numeral 15 in Figure 2 denotes guide elements for the needles 11 while reference numerals 16 and 17 denote guide elements for main needles 18 which are biased in one direction by compression springs 19.

Hooks 20 which are shown in diagrammatic form are controlled by way of the main needles 18.

Reference numeral 21 in Figure 2 identifies an upper lift blade box, reference numeral 22 identifies a lower lift blade box and reference numeral 23 identifies an arresting blade box.

In the lower shed position the hooks 20 can be supported on a hook bottom member 24 while associated with each two hooks 20 is a double roller arrangement 25. The hooks 20 are thus connected together in pairs, by respective flexible connecting members 26 which are passed around the upper roller of each of the double roller assemblies 25.

Passed around each of the lower rollers of the double roller

assemblies 25 is a respective flexible member such as a cord as indicated at 27 which is connected to a fixed point at one end while at its other end it carries a diagrammatically illustrated snap-action hook 28 to which a respective individual cord of the harness 5 (see Figure 1) is connected.

In the case of the hooks 20 which are shown at the left in Figure 2, the two hooks 20 are both supported on the bottom member 24. That means that the harness cords which are connected to the member 27 by the hook 28 and thus ultimately the warp yarns or threads associated therewith are in the lower shed position.

The two pairs of hooks 20 which are shown in the middle of the arrangement in Figure 2 both correspond to the middle shed position of the respective warp yarns or threads. The difference however is that, in the case of the hooks indicated at 20' in the middle of Figure 2, the hook 20' which is shown at the left is supported on the bottom member 24 while the hook 20' shown at the right of that pair is lifted up with the upper lift blade, while the situation is precisely the reverse in the case of the hooks identified by reference numeral 20" in the middle of Figure 2, which ultimately results in the same shed position, namely the middle shed position.

In the case of the hooks 20"' shown at the right in Figure 2, they illustrate the top shed position in which both hooks 20"' are entrained upwardly for example by the associated lift blades of the upper lift blade box 21. That means that in any lift movement of the lift blade boxes 21 and 22 respectively, each warp yarn or thread can be controlled

in such a way that it can occupy one of the first, second and third positions referred to above, namely bottom shed position, middle shed position and top shed position. The bottom shed position or the top shed position can then be secured by virtue of the arresting blade box or the hook bottom member 24 respectively. In that connection it should also be noted that the bottom member 24 and the arresting blade box 23 are arranged at stationary locations in the installation.

In the case of double lift open shed Jacquard machines of that kind, in accordance with the state of the art, the control units which comprise the needles 11, the needles 18 and the hooks 20 and which are associated with each double roller assembly 25 are arranged in rows one beside the other, one above the other and one after the other in the warp direction. The arrangement is actuated for example by way of a punched card. Punched cards of that kind usually have 16 rows of holes in the longitudinal direction, and vary in respect of width. As shown now in Figure 3, a second punched card 12b may be fed to the Jacquard machine, beside or parallel to a first punched card 12a. When using two punched cards 12a and 12b which are fed in parallel and simultaneously, a read-in mechanism as diagrammatically indicated at 8a and 8b in Figure 3 is associated with each punched card. In the view shown in Figure 3, a shed forming mechanism 9a is arranged behind the read-in mechanism 8a and a shed forming mechanism 9b is arranged behind the read-in mechanism 8b.

If for example each Jacquard machine as indicated at 4 in Figure 1 has associated therewith 1344 harness cords, 1344 double roller

assemblies 25 are required, each double roller assembly 25 having associated therewith a pair of hooks 20, main needles 18, needles 11 and needles 10. Accordingly, in order to be able to control each of the 1344 harness cords separately in each lift movement, 2688 control commands or 2688 drop needles 10 are required, which can be actuated by way of punched cards which are punched to correspond to the desired patterning configuration. The conventional practice is for the punched cards 12a and 12b to be fed in side-by-side relationship to each of the Jacquard machines 4, as illustrated for example in Figure 3, with the shed forming mechanisms 9a and 9b which are arranged downstream thereof also being disposed in juxtaposed relationship.

As can be seen from Figure 1, the angle at which the harness 5 is passed to the board 7 from the outer double lift open shed Jacquard machines 4 becomes progressively worse, the greater the desired width of weaving and thus the higher the number of Jacquard machines 4 which are to be arranged in juxtaposed relationship. The width of the reading-in mechanism and the shed forming mechanism directly depends on the punched card width. As from a certain width of weaving, the friction which occurs in relation to the outermost harnesses 5 is too high. Thus, in the arrangement shown in Figure 3, for each shed forming mechanism 9a and 9b, 672 double roller assemblies are arranged in juxtaposed relationship over the width of the loom 1. Therefore, for 1344 harness cords, in the arrangement shown for example in Figure 3, that assembly requires the total width illustrated therein, corresponding to the overall width of the shed forming mechanisms 9a and 9b and the space required between

same. The overall width which is thus required for each Jacquard machine is identified by C in Figure 3.

In comparison therewith, referring now to an arrangement in accordance with the present invention as shown in principle in Figure 4, the overall width as indicated by D is substantially reduced in comparison with the width C shown in Figure 3 in respect of conventional arrangements and is preferably more than halved. The arrangement of the control units (needles 11, needles 18 and hooks 20) of the arrangement in Figure 4 is such that the number of rows of control units, which rows are arranged side-by-side, as considered over the width of the Jacquard machine, is substantially halved and accordingly the number of rows of control units, which are arranged in succession in the longitudinal direction E of the Jacquard machine, is correspondingly increased. As will be apparent from Figure 4, although the read-in mechanism 8 shown therein is also supplied with two punched cards which are identified by reference numeral 12, the supply of punched cards does not occur in parallel juxtaposed mode but 'in one piece' in succession. That means that in the mechanism 8 the number of successively disposed rows of needles 10 and the number of rows of needles 11, which rows are arranged one above the other, is doubled in comparison with a conventional control needle mechanism. That doubling results in an increase in the size of the structure of the shed forming mechanism 9 in the longitudinal direction indicated by E in Figure 4, but at the same time it results in a width D which is substantially reduced in comparison with the required width C shown in Figure 3. That

in turn makes it possible to install a weaving installation for producing double weave materials with a considerable width of weaving, which, in comparison with the state of the art machines, and with the same overall width in respect of the Jacquard machines as indicated at 4 in Figure 1, permits weaving of a double weave material with a width of weaving which is double that of the prior-art machines.

As can be seen from Figure 2, the read-in mechanism 8 illustrated therein is in the form of a control needle mechanism with drop needles and thrust needles. In order simultaneously to be able to read in the punched card arrangement 12 consisting of two punched cards which are fed to the mechanism 8 in succession, the reading-in mechanism is designed to operate accordingly in that fashion. If the two punched cards of the arrangement 12 each have sixteen rows of holes, then the reading-in mechanism 8 also has 32 rows of drop needles 10 which are arranged one behind the other, while 32 rows of thrust needles 11 are then associated in superposed relationship with the needles 10. Figure 2 shows only some needles 10 and some needles 11, for the sake of enhanced clarity of the drawing.

If the punched card arrangement 12 includes a total of 2688 control commands which can be supplied simultaneously, then the arrangement has a number of 84 rows of control units (for example needles 11, needles 18 and hooks 20), as considered over the width of the arrangement. Accordingly the number of juxtaposed rows of control units is 1/32 (namely 2688:84) of the number of effective control commands which can be simultaneously supplied to the control units by the punched cards.

Referring now to Figure 5, shown therein is another embodiment of the invention. Components which correspond to those shown in Figure 5 are denoted by the same reference numerals.

Whereas in the arrangement shown in Figure 2 a thrust needle 11 is associated with each drop needle 10, the arrangement shown in Figure 5 provides that, in regard to the needles identified by 10a, two thrust needles 11 are associated with each thereof. The drop needles 10a are of a suitable design configuration for that purpose, more specifically each needle 10a having two eyes 29. The repulsion effects of the thrust needles 11, that is to say displacement towards the right therein, can be reversed by means of pressure bars 14a which are arranged movably vertically with respect to the needles 11. The pressure bars 14a are desirably designed to be displaced jointly or in a group-wise manner.

In contrast to the embodiment shown in Figure 2 which can receive a punched card arrangement 12 comprising two punched cards which are arranged one behind the other, the arrangement shown in Figure 5 provides that only one punched card 12c is fed to the read-in mechanism. As the number of control commands coming from the punched card is 'doubled' by virtue of the number of thrust needles 11 being doubled in comparison with the number of needles 10a, the number of control commands which are fed to the control units corresponds to the number of control commands involved in the arrangements shown in Figures 2 and 4. A respective one of the needles 11 associated with a needle 10a is associated for example with the upper article of the double woven material to be produced, while the other needle 11 is associated with

the bottom article.

The press bars 14a in Figure 5 are illustrated in such a fashion that a positive read-in operation is taking place, that is to say, a hole in the punched card 12a means that the thrust needles 11 are not being pressed away. If the bars 14a are displaced vertically, for example jointly or in a group-wise manner, then the thrust needles 11 can be pushed away towards the right in the direction indicated by the double-headed arrow B by the bars 14a, which corresponds to a negative reading-in effect, although the corresponding needles 10a have dropped into respective holes in the punched card 12c. The arrangement shown in Figure 5 has the advantage that the construction thereof can be kept narrow in terms of its width in the same manner as in the case of the arrangement shown in Figure 4, but it requires only one punched card and not the two punched cards 12 shown in Figure 4.

In the case of the arrangement shown in Figure 5, each punched card 12c can preferably be read into the mechanism a plurality of times in succession. In that case, by varying the position of the bars 14a, it is possible to vary the pattern information contained on the punched card 12c, more specifically for example upon joint displacement of the bars 14a, the pattern information can be changed from 'negative' to 'positive' or vice versa, and a further variation can then be effected by group-wise displacement of the bars 14a. That gives the advantage that fewer punched cards are required for given woven configurations, than in the state of the art.

It will be appreciated that the above-described constructions in

accordance with the present invention have been described solely by way of example and illustration thereof and that various modifications and alterations may be made therein without thereby departing from the scope of the invention.

CLAIMS

1. A double lift open shed Jacquard machine for a double shed loom comprising a reading-in mechanism for program carriers, a shed forming mechanism with double roller means which after each reading-in operation are adapted to be positioned in first, second and third positions, a respective harness and first and second control units operatively associated with each double roller means and arranged in rows in juxtaposed relationship, in superposed relationship and in succession in the warp direction, the distribution of the control units in relation to the width and the longitudinal direction of the machine being such that the number of juxtaposed rows of control units is substantially reduced in relation to the number of juxtaposed rows of control units in a conventional Jacquard machine of that kind and the number of rows of control units arranged in succession in the longitudinal direction of the Jacquard machine is correspondingly increased.

2. A machine as set forth in claim 1 wherein said number of juxtaposed rows of control units is halved.

3. A machine as set forth in claim 1 wherein said reading-in mechanism is in the form of a needle control mechanism with successively arranged rows of drop needles and superposed rows of thrust needles, and wherein the number of successively arranged rows of drop needles and superoposed rows of thrust needles is doubled in comparison with a conventional needle control mechanism.

4. A machine as set forth in claim 1 comprising a reading-in mechanism in the form of a needle control mechanism with successively arranged rows of drop needles and superposed rows of thrust needles, the

number of rows of thrust needles being doubled in comparison with a conventional needle control mechanism and the number of successively arranged rows of drop needles corresponding to the number of successively arranged rows of drop needles in a conventional needle control mechanism, and wherein first and second thrust needles are associated with each drop needle which are designed accordingly.

5. A machine as set forth in claim 4 comprising pressing bars arranged displaceably vertically with respect to the thrust needles thereby to reverse the repulsion effects produced in respect thereof.

6. A machine as set forth in claim 5 including means for jeint vertical displacement of said pressing bars.

7. A machine as set forth in claim 5 including means for group-wise vertical displacement of said pressing bars.

8. A machine as set forth in claim 1 wherein said reading-in mechanism is in the form of a needle control mechanism for punched cards and said mechanism is adapted for simultaneously reading in two successively supplied punched cards.

9. A machine as set forth in claim 8 wherein the number of juxtaposed rows of control units approximately corresponds to one thirtysecond of the number of effective control commands to be simultaneously applied to the control units by the respective punched card.

10. A double lift open shed Jacquard machine substantially as hereinbefore described with reference to Figures 1, 2 and 4 or Figures 1, 2 and 5 of the accompanying drawings.

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