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(72) Inventor: **Pederzini, Cesare**
21019 Somma Lombardo (IT)

(74) Representative: **Modiano, Guido, Dr.-Ing. et al**
Modiano & Associati,
Via Meravigli, 16
20123 Milano (IT)

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(71) Applicant: **Pederzini, Cesare**
21019 Somma Lombardo (IT)

(54) **Machine for producing loom-woven fabrics decorated by embroidering or by applying decorative elements such as sequins, beads, cordonnets, tapes or the like**

(57) A machine for producing loom-woven fabrics decorated by embroidery or by applying decorative elements, comprising a first working station (2), and a second working station (5), with at least one head (6) for embroidering and/or for applying decorative elements to the sheet of fabric (4) produced in the first working station (2). The sheet longitudinal advancement ele-

ments (9-11) for supporting the sheet of fabric (4) on a working surface (S) that is substantially horizontal at least at the second working station (5), and a movement device (M) for moving the head for embroidering and/or for applying decorative elements along at least one direction (13) transversely to the advancement direction (7) of the sheet of fabric (4) on the working surface (S).

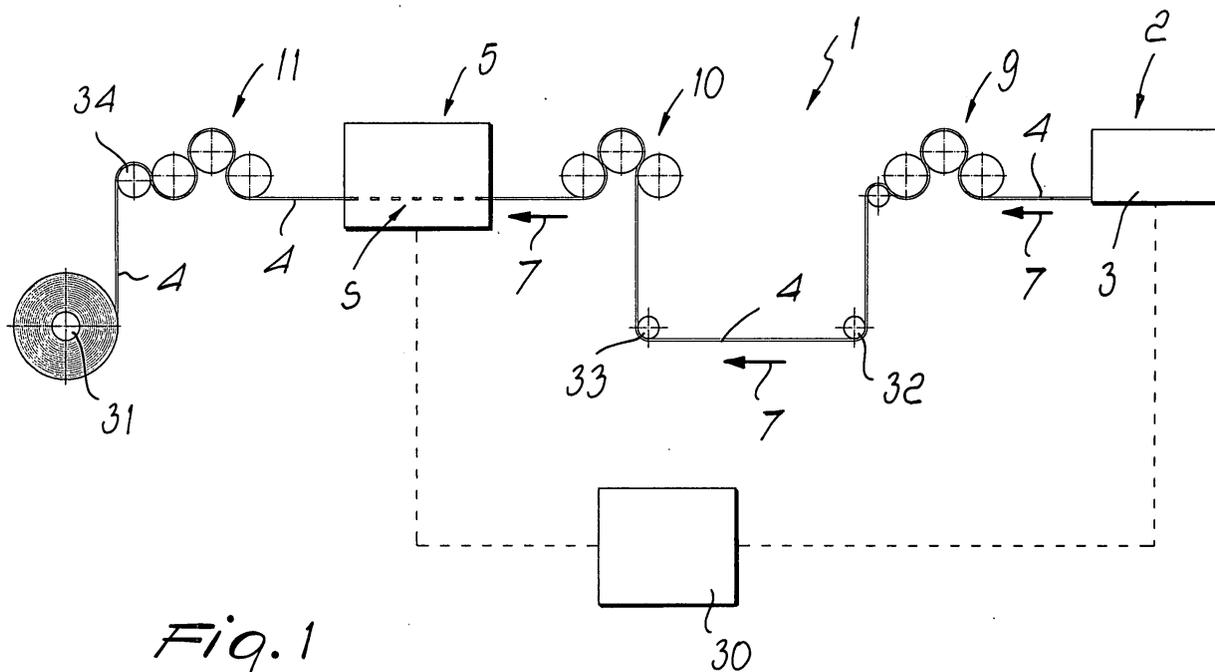


Fig. 1

Description

[0001] The present invention relates to a machine for producing loom-woven fabrics decorated by embroidering or by applying decorative elements such as sequins, beads, cordonnets, tapes or the like.

[0002] Many types of weaving looms, for example warp looms, warp-and-weft looms, needle looms, are known and are used to produce fabrics of various kinds, such as for example warp-and-weft fabrics, knitted fabrics, tulle, lace, both rigid and elastic, et cetera. Hereinafter, the expression "loom-woven fabric" is understood to designate a fabric obtained with these kinds of machine.

[0003] The production of clothing items, but also the production of furniture items that use these kinds of fabric, has a demand for providing on these fabrics embroidery, openwork or the application of decorative elements such as sequins, beads, cordonnets, tapes or the like, aimed at improving the aesthetic appearance of the item.

[0004] Currently, embroidered loom-woven fabrics are obtained by primarily producing the fabric with a loom-weaving machine of the type described above. The fabric is then unloaded from the weaving machine and is dyed and finished. The fabric is then fed to an embroidering machine after dividing such fabric into sheets having dimensions suitable to feed the embroidering machine. After producing the embroidery, the fabric is subjected to further finishing in order to destroy the embroidery backing and then to a new finishing/drying process.

[0005] Substantially the same machines are used to produce fabrics to which decorative elements such as sequins, beads, cordonnets, tapes or the like are applied, since most currently commercially available embroidering machines can be equipped with accessories for applying these decorative elements.

[0006] These processes lead to a highly appreciated product, but suffer the problem of being extremely laborious and of causing a high waste of fabric. Dividing the fabric in order to feed it to an embroidering machine in fact consists in dividing the fabric into sheets that are approximately 15 m long and 1.5 m wide, although the dimensions may vary among embroidering machines, consequently wasting the corresponding head weave and selvages. If one considers, for example, that current warp looms produce sheets of variable length and generally more than 3 m wide, one can see that the operation for dividing the fabric alone entails a considerable waste of fabric, which inevitably affects the overall production costs of these products.

[0007] Moreover, with methods for embroidering or applying decorative elements it is noted that it is very difficult to be able to integrate an ornamental pattern, provided on the fabric during production on the weaving machine, with embroidery or with the application of decorative elements. This operation, in order to lead to a

satisfactory result, requires the embroidery or the decorative elements to be provided or applied at specific regions of the existing ornamental pattern with high precision.

[0008] With currently available machines it is not possible to achieve such precision, and therefore this particular type of decoration is performed by positioning manually, and therefore with long times and high costs, the fabric on the embroidering machine.

[0009] The aim of the present invention is to solve the problems noted above by providing a machine that allows to produce loom-woven fabrics decorated by performing embroidery or by applying decorative elements such as sequins, beads, cordonnets, tapes or the like, with high precision in performing the embroidery or in applying the decorative elements to specific regions of the fabric.

[0010] Within this aim, an object of the invention is to provide a machine that significantly reduces the waste of fabric currently caused by dividing the fabric to load it on embroidering machines.

[0011] Another object of the invention is to provide a machine that by ensuring high precision in performing the embroidery or in applying the decorative elements allows to integrate decorative patterns or designs in general obtained on the fabric during its production.

[0012] Another object of the invention is to provide a machine that allows to obtain sheets of finished product that are longer than those that can be obtained with conventional types of machine, thereby limiting waste during production.

[0013] Another object of the invention is to provide a machine that allows to obtain a product of higher quality with lower production costs than required by known types of machine.

[0014] This aim and these and other objects that will become better apparent hereinafter are achieved by a machine for producing loom-woven fabrics decorated by producing embroidery or by applying decorative elements, such as sequins, beads, cordonnets, tapes or the like, characterized in that it comprises a first working station, in which a loom-weaving machine for producing a sheet of fabric is arranged, and a second working station, in which there is at least one head for embroidering and/or applying decorative elements to said sheet of fabric; means for the longitudinal advancement of the sheet of fabric produced in said first working station along an advancement direction, through said second working station, being provided; said advancement means being adapted to support said sheet of fabric on a working surface that is substantially horizontal at least at said second working station; means for moving said at least one head for embroidering and/or for applying decorative elements along at least one direction that lies transversely to said advancement direction on said working surface being further provided.

[0015] Further characteristics and advantages of the invention will become better apparent from the descrip-

tion of a preferred but not exclusive embodiment of the machine according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic side elevation view of the machine according to the invention;

Figure 2 is a schematic perspective view of the second working station of the machine according to the invention;

Figure 3 is a schematic top plan view of the second working station;

Figure 4 is a schematic front elevation view of the embroidering station.

[0016] With reference to the figures, the machine according to the invention, generally designated by the reference numeral 1, comprises a first working station 2, in which there is a loom-weaving machine 3 of a known type, which is capable of producing a sheet of fabric 4, and a second working station 5, in which there is at least one head 6 for embroidering and/or applying decorative elements to the sheet of fabric 4. The machine comprises means for the longitudinal advancement of the sheet of fabric 4 produced in the first working station 2 along an advancement direction 7 through the second working station 5. The advancement means are adapted to support the sheet of fabric 4 on a working surface S that is substantially horizontal at least at the second working station 5, and means for moving the head or heads for embroidering and/or applying decorative elements along a direction that lies transversely to the advancement direction 7 on said working surface are provided.

[0017] More particularly, the loom-weaving machine 3 can be constituted by a warp loom, by a weft-and-warp loom, by a needle loom or by a loom of a different type capable of producing rigid fabrics or elastic fabrics of the knitted or non-knitted type, plain fabrics or fabrics decorated with patterns and/or openwork, and lace or fabrics of another type.

[0018] The head or heads 6 can be constituted by known types of embroidering heads, also capable of performing sponge-stitch and/or openwork embroidering, which can optionally be equipped with accessories, also of a known type, for applying decorative elements such as sequins, beads, cordonnets, tapes or the like.

[0019] The means for the advancement of the sheet of fabric 4 comprise a first group of sheet tension rollers 9, which are arranged directly downstream of the first working station 2 along the direction of advancement of the sheet of fabric 4 along the direction 7.

[0020] The first group of sheet tension rollers 9 can be constituted by the group of sheet tension rollers that is usually located at the output of loom-weaving machines and cooperates with the other elements of these machines in forming the sheet of fabric 4.

[0021] The advancement means of the sheet of fabric 4 also comprise two other groups of sheet tension rollers,

respectively a second group of sheet tension rollers 10, which is arranged directly upstream of the second working station 5, and a third group of sheet tension rollers 11, which is arranged directly downstream of the second working station 5.

[0022] The sheet tension rollers of the various groups are arranged so that their axes are horizontal and are orientated at right angles to the advancement direction 7 of the sheet of fabric 4.

[0023] The function of the first group of sheet tension rollers 9 is to ensure that the sheet of fabric 4 has the tension necessary to form it in the weaving machine 3.

[0024] The function of the second group of sheet tension rollers 10 and of the third group of sheet tension rollers 11 is to keep the sheet of fabric 4 adequately tensioned on a substantially horizontal working surface S at the second working station 5 in order to allow the head or heads 6 to operate correctly.

[0025] Preferably, the second group of sheet tension rollers 10 and the third group of sheet tension rollers 11 are actuated in a mutually correlated manner and optionally in a manner that is correlated to the actuation of the first group of sheet tension rollers 9, so that between the second sheet tension roller group 10 and the third sheet tension roller group 11, i.e., at the second working station 5, the sheet of fabric 4 is in the same dimensional conditions, i.e. has the same tension, with which it is produced by the weaving machine 3, as will become better apparent hereinafter.

[0026] The means for moving M the head or heads 6 are preferably adapted to produce the translational motion of the head or heads 6, with the corresponding shuttles, which are of a known type, along a first direction 12, which is parallel to the advancement direction 7, and along a second direction 13, which is perpendicular to the advancement direction 7 on the horizontal working surface on which the sheet of fabric 4 is arranged at the second working station 5.

[0027] More particularly, merely by way of example, the movement of the head or heads 6 can be obtained by mounting the head or heads 6 on an upper bar 14 that is arranged horizontally and at right angles to the advancement direction 7. The upper bar 14 is coupled, so that it can slide along the direction 13, to a pair of blocks 15a, 15b, for example by means of a dovetail-shaped guide.

[0028] The blocks 15a, 15b are interposed between the upper bar 14 and a lower bar 16, which is arranged parallel to the upper bar 14 and is rigidly coupled thereto in its translational motion along the directions 12 and 13. The lower bar 16 is coupled to the blocks 15a, 15b, so that it can slide along the direction 13, for example by means of another dovetail-shaped guide, as shown. The shuttle of each head 6 is fixed to the lower bar 16 below the corresponding head 6.

[0029] The bars 14 and 16 and the blocks 15a, 15b are supported by a frame 17, which is arranged at the second working station 5, and the blocks 15a, 15b can

move on command, in a controlled manner, parallel to the direction 12, since they are crossed by female threads with axes 18a, 18b that are parallel to the direction 12 and with which threaded shafts 19a, 19b engage; said shafts are supported by the frame 17 so that they can rotate about their axes, which coincide with the axes 18a, 18b. The shafts 19a, 19b are connected to a single electric motor or to a pair of electric motors 20a, 20b, synchronized so that the actuation of said motor or motors produces a monolithic translational motion of the pair of blocks 15a, 15b along the direction 12.

[0030] The bars 14 and 16 are crossed by female threads whose axes are parallel to the direction 13, and two threaded shafts 21 and 22 engage said female threads and are supported, so that they can rotate about their respective axes, by supports, not shown, which are fixed to the blocks 15a, 15b. The shafts 21 and 22 are connected to a motor 23, as shown, or to a pair of synchronized motors, supported by the blocks 15a, 15b so that the actuation of said motor or motors achieves a monolithic translational motion of the bars 14, 16 along the direction 13.

[0031] The translational motion of the blocks 15a, 15b and of the bars 14 and 16 along the directions 12 and 13 can be controlled with high precision, for example by using motors 20a, 20b and 23 of the step type and optionally by fitting sensing devices such as encoders or the like on the threaded shafts or linear detectors directly on the blocks 15a, 15b and/or on the bars 14 and 16 to also provide feedback control of the movement of the head or heads 16.

[0032] If multiple heads 6 are used, said heads are arranged side by side along the longitudinal extension of the upper bar 14, i.e., parallel to the direction 13.

[0033] Such described actuation system forms the movement means M.

[0034] Preferably, the motors 20a, 20b and 23 are actuated in a manner that is correlated to the actuation of the means for the advancement of the sheet of fabric 4 along the advancement direction 7, so that the movements of the head or heads 6 are correlated to the advancement of the sheet of fabric 4 along the advancement direction 17. In this manner, the head or heads 16 can work on the sheet of fabric 4 while it is advancing along the advancement direction 7.

[0035] Preferably, both the weaving machine 3 and the head or heads 6 are adapted to work according to preset programs, and there are means for correlating the corresponding actuation programs so as to also be able to perform, with the head or heads 6, embroidering or the application of decorative elements at designs or decorations on the sheet of fabric 4 produced by the machine 3 during the production of the sheet of fabric 4.

[0036] If the weaving machine 3 is constituted by a known type of machine that produces a fabric that bears a design or decoration by using a program on perforated tape or punched card, i.e., provided with a programming system of the mechanical type, the head or heads 6 also

may be actuated with a similar programming system, by composing the program for the actuation of the head or heads 6 in a manner that is correlated to the program for the actuation of the weaving machine 3.

[0037] If instead the weaving machine 3 is constituted by a machine with electronic programming, it is preferable to manage electronically also the actuation of the head or heads 6. In this case, there is preferably a programmable control and actuation element 30 of the electronic type that may constitute the correlating means, which supervises the operation of the entire machine according to the invention. The actuation and control element 30 is connected to the weaving machine 3 so as to control its actuation, in particular as regards the provision of designs or decorations in general of the sheet of fabric 4 during its production. Said control and actuation element 30 controls the actuation of the motors 20a, 20b, 23 according to preset work programs that are correlated to the programs used to produce the sheet of fabric 4, so as to achieve high precision in the execution of embroidery and/or in the application of decorative elements at specific regions of the designs or decorations performed during fabric production. The control and actuation element 30 is furthermore preferably also connected to the means for the advancement of the sheet of fabric 4 so as to optimize this particular process.

[0038] More particularly, to provide embroidery or apply decorative elements on a sheet with designs or decorations, bearing in mind that in a weaving machine the "repeat length" is the number of beats of the weaving machine required to provide a preset design and decoration during production of the sheet of fabric and that the "repeat" is the width of the design or decoration, i.e., the repetition along the width, determined by the number of needles or traces or warp threads (depending on the type of weaving machine used), with which the design or decoration is repeated along the width of the sheet of fabric (i.e., at right angles to the advancement direction 7), the number of heads 6 arranged in the second working station 5 preferably matches the number of repeats of the design or decoration, and said heads 6 are actuated according to a program that is correlated to the program for producing the sheet of fabric, so that the execution of the embroidering and/or the application of the decorative elements can be performed according to the same design or according to a design that is correlated thereto with the same repeat length and with the same repeat with which the design or decoration has been produced by the weaving machine 3.

[0039] Optionally, along the path followed by the sheet of fabric 4 in its passage from the first working station 2 to the second working station 5, it is possible to provide additional devices or means for controlling the advancement of the sheet of fabric 4, which are capable of detecting the actual position of regions of the sheet of fabric 4 and of transmitting this information to the control and actuation element 30. Said devices or means can be constituted for example by sensors or photocells

P of a known type, capable of detecting specific regions of the sheet of fabric 4, so that the intervention of the head or heads 6 on the sheet of fabric 4 occurs with extreme precision, particularly if one wishes to embroider or apply decorative elements to a design or decoration produced by the weaving machine 3.

[0040] For the sake of completeness in description, it should be noted that the path of the sheet of fabric 4 runs from the weaving machine 3 to a takeup roller 31 arranged downstream of the second working station 5 after passing through the second working station 5, and that said path is determined not only by the sheet tension roller groups 9, 10, 11 but also by guiding rollers 32, 33, 34.

[0041] Operation of the machine according to the invention is as follows.

[0042] The weaving machine 3 produces the sheet of fabric 4, optionally with designs and decorations, in a per se known manner, preferably in a manner that is actuated and controlled by the actuation and control element 30, as described above.

[0043] As the sheet of fabric 4 is produced, it advances gradually, by the action of the sheet tension roller groups 9, 10, 11, toward the takeup roller 31, passing through the second working station 5. At the second working station 5, the sheet of fabric 4 is embroidered or decorative elements are applied thereto by the action of the head or heads 6. Owing to the fact that the sheet of fabric 4, at the second working station 5, can be kept in, or returned to, the same dimensional conditions in which it was produced, and owing to the fact that the head or heads 6 can be actuated according to a program that is correlated to the program for forming designs or decorations followed by the weaving machine 3 during the production of the sheet of fabric 4, with the machine according to the invention it is possible to perform embroidering or apply decorative elements in specific regions of the existing design or decoration, thus performing in a completely automated manner an operation that currently can be performed only by means of a manual intervention.

[0044] In any case, even if the machine according to the invention is used simply to embroider or apply decorative elements to a plain sheet of fabric, i.e., a sheet without designs or decorations, considerable advantages are achieved with respect to current production techniques, since the sheet of fabric 4 does not have to be unloaded from the weaving machine and divided in order to be loaded on the machine that embroiders and/or applies decorative elements. In this manner, the machine according to the invention reduces waste, manual interventions and therefore production costs, obtaining a product that is qualitatively improved with respect to the use of conventional machines.

[0045] In practice it has been found that the machine according to the invention fully achieves the intended aim, since it is capable of producing autonomously, i.e., without requiring the intervention of other machines, and

in a completely automated manner, loom-woven fabrics decorated by performing embroidering or by applying decorative elements, such as sequins, beads, cordonnets, tapes or the like, with high precision in performing the embroidery or in applying the decorative elements to specific regions of the fabric, obtaining products that are qualitatively improved and have lower production costs with respect to similar products obtained with currently commercially available machines.

[0046] The machine thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0047] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0048] The disclosures in Italian Patent Application No. MI2003A001284 from which this application claims priority are incorporated herein by reference.

[0049] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

30 Claims

1. A machine for producing loom-woven fabrics decorated by producing embroidery or by applying decorative elements, such as sequins, beads, cordonnets, tapes or the like, **characterized in that** it comprises a first working station (2), in which a loom-weaving machine (3) for producing a sheet of fabric (4) is arranged, and a second working station (5) with at least one head (6) for embroidering and/or applying decorative elements to said sheet of fabric (4); and advancement means (9,10,11) for the longitudinal advancement of the sheet of fabric (4) produced in said first working station (2) along an advancement direction (7), through said second working station (5), said advancement means (9) being adapted to support said sheet of fabric (4) on a working surface (S) that is substantially horizontal at least at said second working station (5); movement means (M) for moving said at least one head (6) for embroidering and/or for applying decorative elements along at least one direction (13) that lies transversely to said advancement direction on said working surface being further provided.
2. The machine according to claim 1, **characterized in that** said movement means (M) are adapted to produce the translational motion of said at least one head (6) for embroidering and/or for applying dec-

orative elements along a first direction (12) that is parallel to said advancement direction (7) and along a second direction (13) that is perpendicular to said advancement direction (7) on said working surface (S).

3. The machine according to claim 1, **characterized in that** said movement means (M) are functionally connected to said advancement means (9,10,11) for a movement of said at least one head (6) for embroidering and/or for applying decorative elements, on said working surface (S), which is correlated to the advancement of said sheet of fabric (4) along said advancement direction (7).

4. The machine according to one or more of the preceding claims, **characterized in that** said advancement means comprise a first group of sheet tension rollers (9), which is arranged directly downstream of said first working station (2) along the advancement direction (7) of said sheet of fabric (4) along said advancement direction (7); the sheet tension rollers (9) of said first group being arranged so that their axes are horizontal and are transverse to said advancement direction (7).

5. The machine according to one or more of the preceding claims, **characterized in that** said advancement means comprise a second group (10) of sheet tension rollers that is arranged directly upstream of said second working station (5) and a third sheet tension roller group (11) that is arranged directly downstream of said second working station (5) along the advancement direction (7) of said sheet of fabric (4) along said advancement direction (7); the sheet tension rollers of said second roller group (10) and of said third roller group (11) being arranged so that their axes are horizontal and transverse with respect to said advancement direction (7).

6. The machine according to one or more of the preceding claims, **characterized in that** said at least (6) one head for embroidering and/or for applying decorative elements comprises multiple heads for embroidering and/or for applying decorative elements, which are arranged side by side along a direction (13) that is substantially perpendicular to said advancement direction (7).

7. The machine according to one or more of the preceding claims, **characterized in that** said loom-weaving machine (3) is adapted to produce a sheet of fabric (4) that is decorated according to a preset program, and **in that** said at least one head (6) for embroidering and/or for applying decorative elements is adapted to work according to a preset program that is correlated to a program for the actua-

tion of said loom-weaving machine (3) in order to perform, in said second working station (5), embroidery and/or applications of decorative elements at decorations that are present on the sheet of fabric (4) that originates from said first working station (2).

8. The machine according to one or more of the preceding claims, **characterized in that** it comprises a programmable actuation and control element (30) that is connected to said loom-weaving machine (3) and to said at least one head (6) for embroidering and/or for applying decorative elements in order to actuate them according to preset working programs.

9. The machine according to one or more of the preceding claims, **characterized in that** said programmable control and actuation element (30) is of the electronic type.

10. The machine according to one or more of the preceding claims, **characterized in that** it comprises means (P) for controlling the advancement of said sheet of fabric (4) along said advancement direction (7), said advancement control means (P) being functionally connected to said control and actuation element (30).

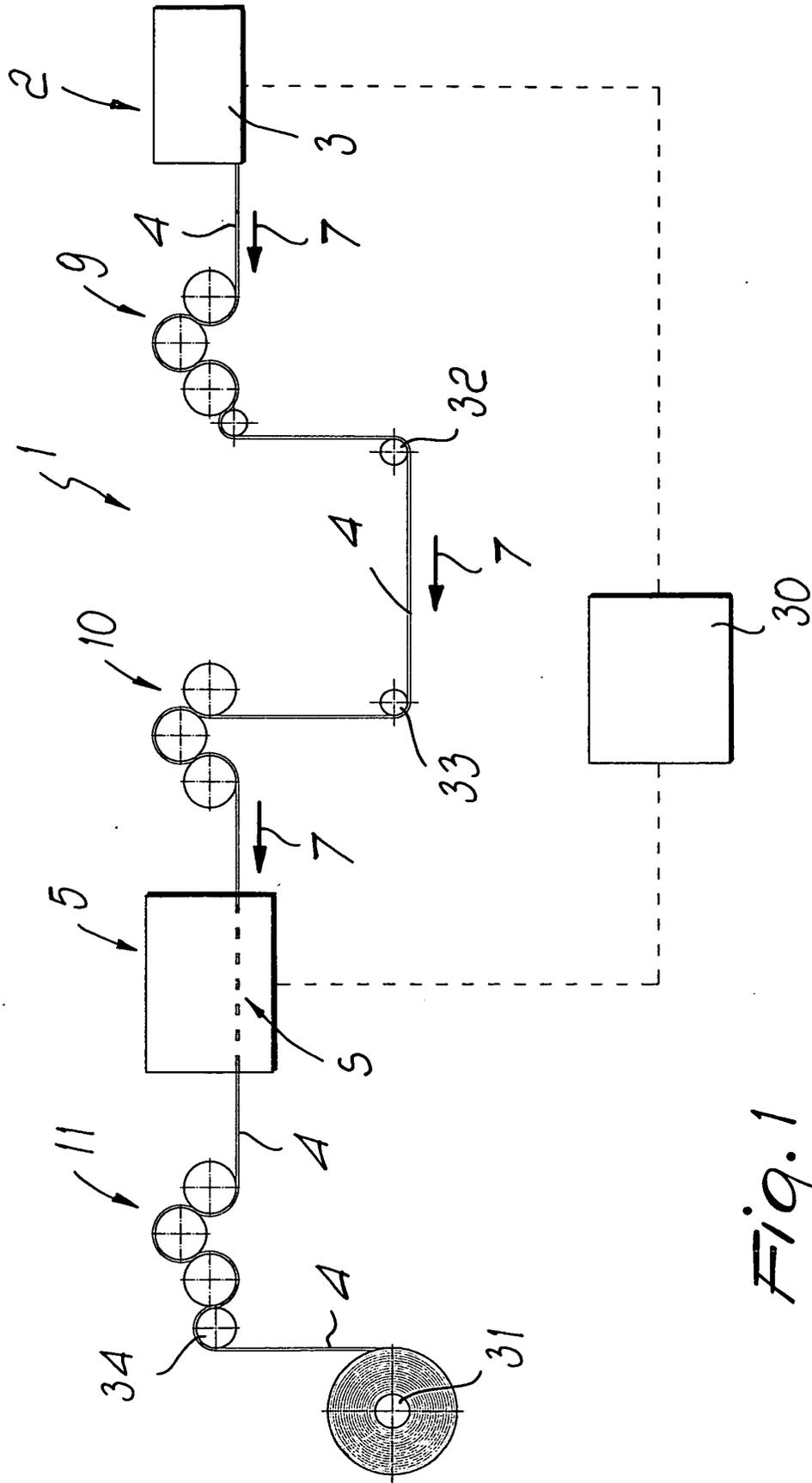


Fig. 1

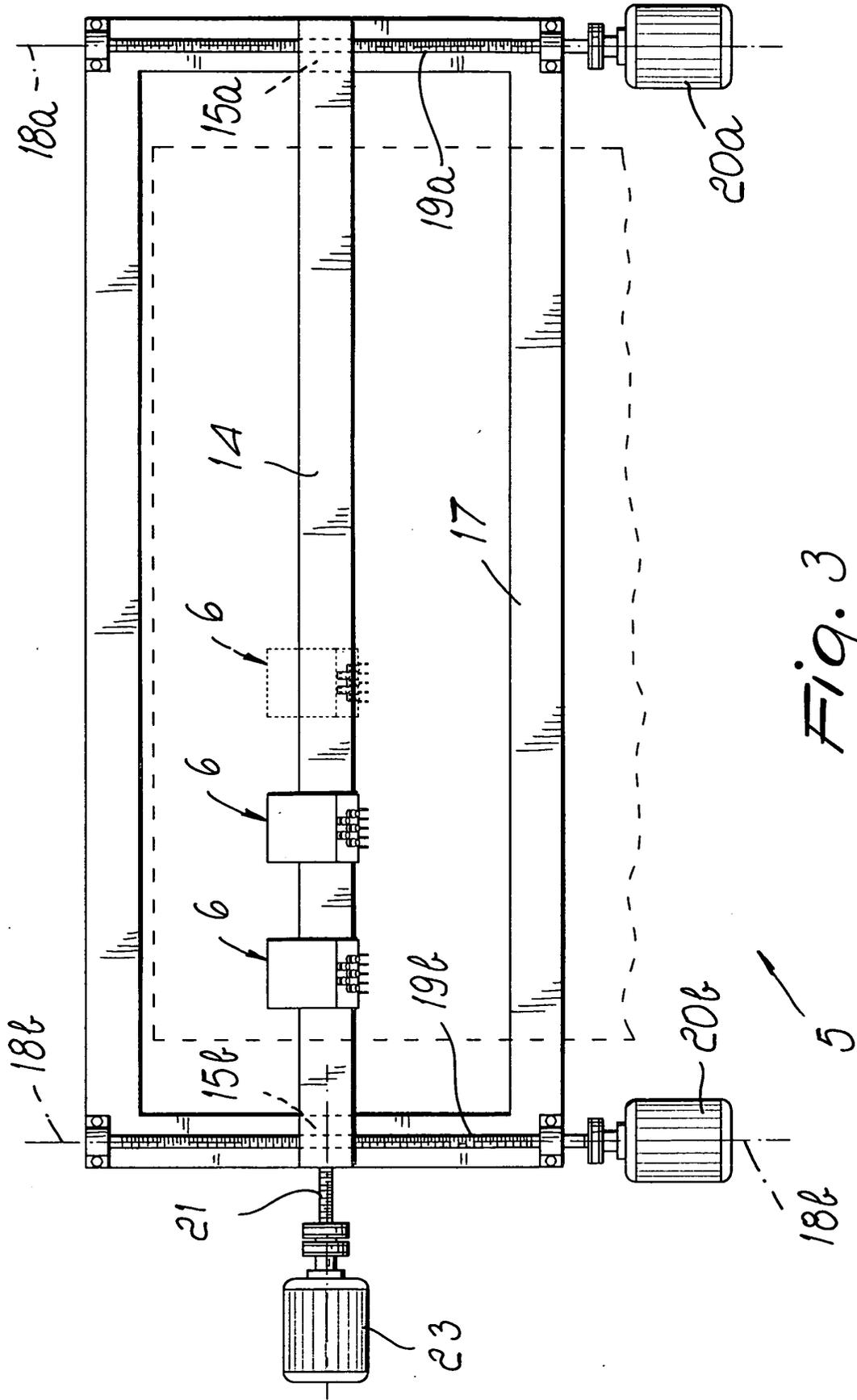


Fig. 3

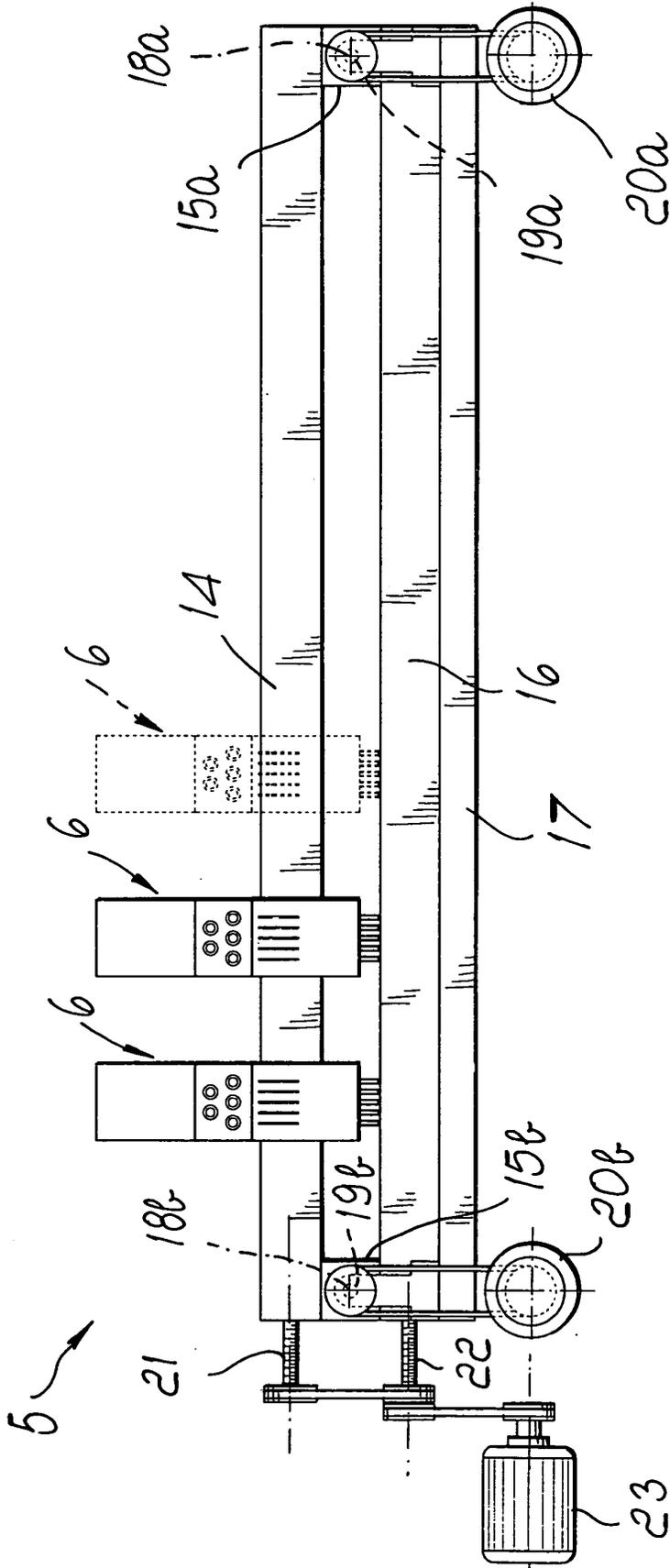


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 01 2890

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		6 October 2004	Herry-Martin, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 01 2890

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