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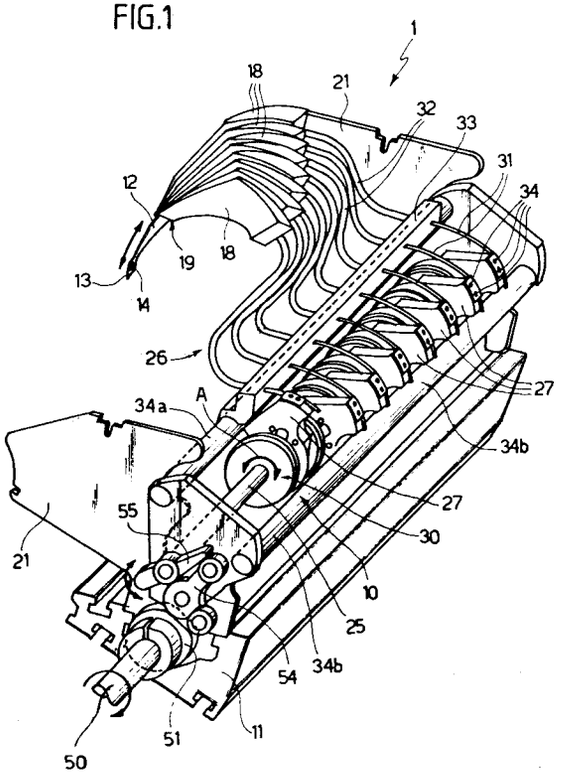
(54) Weft yarn presentation device for looms.

(57) A weft yarn presentation device for looms, for selectively moving one or more weft yarns from a standby position to an insertion position wherein the weft yarn is inserted inside the shed (5) by at least one weft feed gripper (5a); the device presenting at least one movable element (12)(arrow) cooperating with the weft yarn for presentation; means (18) for guiding the movable element along a predetermined path at the shed; reciprocating actuating means (25); flexible transmission means (26) for connecting the movable element (12) integral with a respective control element (27); and, for each movable element (12), a friction clutch (30) for selectively connecting a respective control element (27) integral with the actuating means (26).

FIG.1



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The present invention relates to a weft yarn presentation device for looms, which by means of the same weft carrying grippers provides for selectively feeding through the shed yarns of different colours or types.

On modern looms, the weft yarn is fed through the shed formed by the heddles by means of two grippers - a carrying and a drawing gripper - which move back and forth through the shed crosswise to the warp yarns; the carrying gripper picking up the weft yarn from the reel and carrying it roughly halfway along the shed to the so-called "exchange point", and the drawing gripper picking up the yarn from the carrying gripper at the exchange point and drawing it to the end of the shed where it is released.

Gripping and release of the weft are preceded by a "presentation" step in which the weft is partly unwound off the reel and so positioned at the shed as to be picked up by the grippers as they move back and forth through it. More specifically, the presentation step is performed by a so-called presentation device which, among other things, must be capable of positioning one or, at most, two of the available weft yarns in time and in such a position as to be gripped by the carrying gripper; and of neutralizing the presentation function to arrest the loom and repeat the cycle in the event the previously inserted yarn should snap. Other factors to be taken into account are that each machine cycle is performed in less than 100 milliseconds, of which less than half are available for presentation; that the device must feature a system for selecting from among the available weft yarns; and that the device must not exceed a given overall size for enabling troublefree threading of the weft yarns.

Known solutions normally feature electromagnets which, by means of a mechanical clutch similar to a ratchet, cooperate with a cam mechanism to move the selected yarn; and the yarn is selected by energizing the electromagnet which moves the yarn, for example, according to a predetermined pattern memorized electronically or on a support such as a perforated tape, which a reader converts into pulses for the electromagnets.

Known devices present several drawbacks. In particular, they pose limits to the insertion speed obtainable; are mechanically fairly complex and fragile; and do not permit a rational, accessible arrangement of the movable elements or "arrows" cooperating directly with the weft yarn.

It is an object of the present invention to provide a weft yarn presentation device of relatively straightforward design, which is strong, compact, capable of operating at high speed, and provides for inserting a large number of different weft yarns for producing fabrics and patterns featuring weft yarns of different colours and/or types.

According to the present invention, there is provided a weft yarn presentation device for looms, for selectively moving one or more weft yarns from a standby position to an insertion position wherein the weft yarn is inserted inside the shed of the loom by at least one weft feed gripper; the device comprising at least one movable element cooperating with the weft yarn for presentation; and drive means for producing a predetermined reciprocating motion of the movable element at the shed; characterized in that said drive means comprise: means for guiding the movable element along a predetermined path at the shed; actuating means rotating back and forth; flexible transmission means for connecting each movable element integral with a respective control element; and a friction clutch for each said movable element, for selectively connecting a respective control element integral with said actuating means.

More specifically, the device comprises an array of said movable elements arranged side by side and each cooperating with a different weft yarn; and elastic contrasting means for each said movable element; the elastic contrasting means cooperating with the control means for maintaining the corresponding movable element in the standby position when the corresponding friction clutch is released. Also, the movable elements, known as "arrows", are arc-shaped and slide inside arc-shaped guides formed in respective supports, from a first end of which the respective tips of the movable elements cooperating with the weft yarns project between a withdrawn position corresponding to said standby position, and an extracted position corresponding to said insertion position.

This therefore provides for overcoming all the above drawbacks, by virtue of the device being highly straightforward, compact and reliable in design, and enabling at least a 50% increase in the number of weft yarns insertable on the loom.

The supports are fixed side by side so as to fan out and converge, in a first plane, at said first end; and are offset in pairs by a given angle so as to also fan out and converge at said first end in a second plane perpendicular to the first. Each arrow thus slides in a sector which is so oriented that, in the insertion position, the arrows converge at a narrow portion of the shed where any weft yarn presented may be gripped easily.

According to the present invention, electromagnetic clutches are used, each consisting of an electromagnetic disk brake comprising a first circular element defining the armature and secured angularly integral with a first drive shaft of the device rotating back and forth over a predetermined arc; and a second circular element connected to a coil, defining the core, and fitted integrally to the respective control element.

As opposed to traditional mechanical clutches, the device according to the present invention features electromagnetic clutches which operate the arrows by means of flexible cables, and are made selectively integral, one by one and only for as long as necessary, with a drive shaft rotating back and forth. This may be achieved indifferently by means of a cam device in turn operated by a rotary shaft controlled by the loom or by an independent motor, or by means of a reversing motor connected directly to the drive shaft.

In either case, as the contact surfaces of an electromagnetic clutch need only be moved a few tenths of a millimeter as compared with several millimeters of a mechanical clutch, engagement time is drastically reduced, thus making more time available for the weft yarn movement, which is smoother, involves less risk of the yarn snapping, and is more accurate, also by virtue of selection involving no mechanical slack.

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a three-quarter, top rear view in perspective of a presentation device in accordance with the present invention;

Figure 2 shows a larger-scale top plan view of a detail of the Figure 1 device;

Figure 3 shows a cross section of the Figure 1 device fitted to a loom of which only the main parts are shown schematically.

Number 1 in the accompanying drawings indicates a weft yarn presentation device fittable to a known loom 2 of which, for the sake of simplicity, Figure 3 only shows schematically the heddles 3 and respective warp yarns 4 forming shed 5 in which a batten 6 with a reed 7 forms a fabric 8 by feeding through shed 5, crosswise to yarns 4 and by means of known grippers 5a, weft yarns (not shown) which are "presented" at shed 5 by device 1 as described below.

Device 1 substantially comprises a frame 10 fitted to a base 11 in turn fitted in known manner (not shown) to loom 2; movable elements or "arrows" 12 cooperating in known manner with the weft yarns for presentation, and movable along a predetermined path to move the weft yarns from a standby position to an insertion position, to the side of shed 5, where they are picked up easily by a gripper 5a and fed transversely through shed 5; and means, fitted to frame 10, for selectively moving arrows 12 one by one between the above positions.

According to the invention, device 1 presents an array of movable elements or arrows 12 arranged side by side and each cooperating in known manner (not shown) with a weft yarn of different colour and/or type. In the example shown, arrows 12 consist of arc-shaped bars, each presenting a straight end 15 and, at the opposite end, an arrow-shaped tip 13 with a through hole 14 which is engaged by the weft yarn for presentation as this is unwound off a known reel (not shown) of loom 2.

Arrows 12 slide inside respective mutually connected, arc-shaped guides 16 formed longitudinally, in the example shown, through respective flat, half-moon-shaped supporting sectors 18; and arrows 12 and sectors 18 are so arranged that tips 13 cooperating with the weft yarns project from sectors 18, at shed 5, between a withdrawn position (shown by the continuous line in Figure 3) corresponding to said standby position of the weft yarns, and an extracted position (shown by the dotted line in Figure 3) corresponding to the insertion position of the weft yarns.

Tips 13 project from sectors 18 through a first open end 19 opposite a respective open end 20 facing away from shed 5 in use; and sectors 18 are fixed side by side on the inner side of frame 10 - in the example shown, to a lateral upright 21 of frame 10 - and fan out so that, in a first plane parallel to that of Figure 2, they converge towards end 19. According to one characteristic of the invention, sectors 18 for supporting and guiding arrows 12 are also offset in pairs by a given angle so as to also fan out in a second plane perpendicular to the first (and parallel to that of Figure 3) while still converging towards end 19.

In the example shown, sectors 18 are connected side by side and in mutually contacting manner by respective opposite lateral faces 22, 23 (Figure 2) in the form of inclined surfaces; and are also rotated in relation to one another (Figures 1 and 3), with the center of rotation at ends 19 and in the direction of the arc along which movable elements or arrows 12 slide, so as to assume an overall configuration in which they are inclined gradually in the form of an arc-shaped fan, and in which (Figure 3) arrows 12 are set far apart in the standby position (i.e. when almost fully withdrawn inside ends 19 of sectors 18) and are set close together in the insertion position in which the weft yarns are gripped (i.e. when arrows 12 are fully extracted from sectors 18 as shown by the dotted lines in Figure 3 and the continuous line for a single arrow 12 in Figure 1).

To set the desired weft yarn to the insertion position when required, arrows 12 are movable selectively between the extracted and withdrawn positions via drive means which, according to the invention, comprise guides 16; actuating means 25 rotating back and forth; flexible transmission means 26 for connecting the end 15 of each arrow 12 integrally to a respective control element 27 consisting of a hub sector fitted idly to actuating

means 25; and friction clutches 30 (Figures 1 and 2) - one for each arrow 12 - for selectively connecting each control element 27 angularly integral with actuating means 25 for a predetermined time interval.

In the example shown, the actuating means comprise a drive shaft 25 fitted idly to uprights 21 and rotating back and forth over a predetermined arc (as shown by arrow A in Figure 1); and flexible transmission means 26 comprise respective flexible cables, straps or plaits 31 made of metal or synthetic plastic and housed in sliding manner inside respective sheaths 32 fitted in known manner to sectors 18 at one end, and, at the opposite end, to frame 10, in particular to a bar 33 fitted to a cross member 34a which, together with a further cross member 34b and base 11, provides for connecting uprights 21. Each flexible cable 31 is fixed, at one end, integral with end 15 of respective arrow 12 which is accessed along respective guide 16 and through the open end 20 of respective sector 18; and at the other end is fitted integral with respective control element 27, and is adjustable in length, e.g. by means of a pair of screws 34.

According to the invention, device 1 also comprises elastic contrasting means for arrows 12, in turn comprising helical springs 35 (Figure 3) - one for each arrow 12 - which are preloaded and stretched between a transverse connecting bar 36 of frame 10, and a radial arm 37 of respective hub sector 27 constituting the control element of each arrow 12. When clutches 30 are released so that hub sectors 27 are mounted idly and coaxially on shaft 25, springs 35 therefore act in the direction of arrow 40 to secure elements 27 against cross member 34b and so pull cables 31 in such a direction as to slide arrows 12 away from shed 5 into the retracted standby position.

According to a further characteristic of the invention, friction clutches 30 are electromagnetic, and comprise respective known electromagnetic disk brakes fitted coaxially and side by side to shaft 25, and each comprising a first circular element 41 (Figure 2) defining the armature of the electromagnet and secured angularly integral with shaft 25, and a second circular element 42 coaxial with element 41, connected to a coil 43 to define the core of the electromagnet, and fitted integral and coaxial with respective hub sector 27 which is also fitted coaxially to shaft 25. Each electromagnetic clutch 30 is supplied by a flexible conducting element consisting of a U-shaped metal strap 44 (Figure 3) enabling respective clutch 30 to oscillate integral with shaft 25. More specifically, each strap 44 is fixed to a panel 45 of frame 10, and is connected removably to an electric socket 46 formed in respective control element 27 and connected electrically to the core of the respective electromagnet.

According to a preferred embodiment shown in Figure 1, oscillation of drive shaft 25 is controlled by a second drive shaft 50 parallel to the first and rotating in a predetermined direction via a cam 51 with a predetermined profile. Cam 51 is fitted angularly integral with drive shaft 50, and cooperates with a first arm of a rocker arm 54 fitted to frame 10 in oscillating manner and parallel to shafts 25, 50, and a second arm of which cooperates with a finger 55 angularly integral with shaft 25. Shaft 50 may be operated by a known independent motor (not shown), e.g. a step or brushless motor, synchronized with loom 2, or in known manner (not shown) directly by loom 2 via an appropriate mechanical transmission.

In actual use, for each rotation cycle of shaft 50, each element 41 oscillates together with shaft 25 as governed by cam 51, which provides for a down phase, a return phase, and a hold phase in which clutch 30 corresponding to arrow 12 of the selected weft yarn is energized. By the time the movement is commenced, clutch 30 thus presents the necessary torque to overcome respective spring 35 connected to element 27 and to respective element 42, as well as the inertia of the clutch 30-cable 31 assembly, and so make respective element 27 integral with shaft 25 at the end of the hold phase of cam 51. Element 27 is thus rotated over to cross member 34a and, as it does so, slides respective cable 31 which, acting as a push element, slides respective arrow 12 towards shed 5 and gradually out of respective sector 18 into the extracted position in which the weft yarn engaging hole 14 is set to the insertion position.

The selected clutch 30 remains energized throughout the down phase-return phase cycle, until the pattern calls for a different weft yarn, or pending breakage of the yarn. In both cases, clutch 30 is released at the hold phase (by cutting off current supply via respective strap 44) and, only in the first case, a further clutch 30 corresponding to the newly selected yarn is energized. When clutch 30 is released, elements 41, 42 are detached so that element 41 is again made idle in relation to shaft 25; spring 35 swings respective element 27 back into contact with cross member 34b; and cable 31, which in this case acts as a traction element, restores respective arrow 12 to the withdrawn position and the respective discarded weft yarn to the standby position.

Unlike traditional devices in which selection is made by the clutch and the subsequent down and return phases are controlled purely mechanically, each selected clutch 30 of device 1 provides the necessary torque to overcome the friction and inertia of all the other moving parts and as such must remain engaged, as described, throughout the en-

tire cycle, while springs 35 provide solely for maintaining arrows 12 connected to elements 27 of the non-energized clutches 30 in the standby position.

As the total weight of cables 31 and arrows 12 is no more than a few grams, thus greatly reducing the size of clutches 30 and the torques involved, the above device for controlling shaft 25 may be replaced by a straightforward independent reversing motor 60 (Figure 2) synchronized with loom 2 and with the output connected directly to shaft 25. In addition to simplifying and reducing the overall size of device 1, this also provides for maneuvering arrows 12 when loom 2 is arrested, e.g. for setting the arrow to the best position for threading the yarn manually or automatically.

Claims

1. A weft yarn presentation device for looms, for selectively moving one or more weft yarns from a standby position to an insertion position wherein the weft yarn is inserted inside the shed of the loom by at least one weft feed gripper; the device comprising at least one movable element cooperating with the weft yarn for presentation; and drive means for producing a predetermined reciprocating motion of the movable element at the shed; characterized in that said drive means comprise: means for guiding the movable element along a predetermined path at the shed; actuating means rotating back and forth; flexible transmission means for connecting each movable element integral with a respective control element; and a friction clutch for each said movable element, for selectively connecting a respective control element integral with said actuating means.

2. A device as claimed in Claim 1, characterized in that it also comprises elastic contrasting means for each said movable element; said elastic contrasting means cooperating with the control means for maintaining the corresponding movable element in a standby position when the corresponding friction clutch is released.

3. A device as claimed in Claim 1 or 2, characterized in that it comprises an array of said movable elements arranged side by side and each cooperating with a different weft yarn; the movable elements being arc-shaped and sliding inside arc-shaped guides formed in respective supports, from a first end of which the respective tips of the movable elements cooperating with the weft yarns project between a withdrawn position corresponding to said standby position, and an extracted position corresponding to the insertion position; at the opposite end, said supports being open and housing said flexible transmission means which comprise respective flexible cables sliding inside respective sheaths fixed at one end to said supports and at the opposite end to the supporting frame of the device.

4. A device as claimed in Claim 3, characterized in that each said flexible cable is fitted in fixed manner, at one end, integral with the end, opposite said tip, of a respective said movable element, and at the other end is fixed integral with a respective said control element of the movable element and is adjustable in length.

5. A device as claimed in Claim 3 or 4, characterized in that said supports are fixed side by side and fan out so as to converge, in a first plane, at said first end; and are offset in pairs by a predetermined angle so as to also fan out and converge at said first end in a second plane perpendicular to the first.

6. A device as claimed in Claim 5, characterized in that said supports are connected side by side by respective opposite inclined lateral faces, and are rotated in relation to one another, with the center of rotation at said first end, in the direction of the arc along which the movable elements slide.

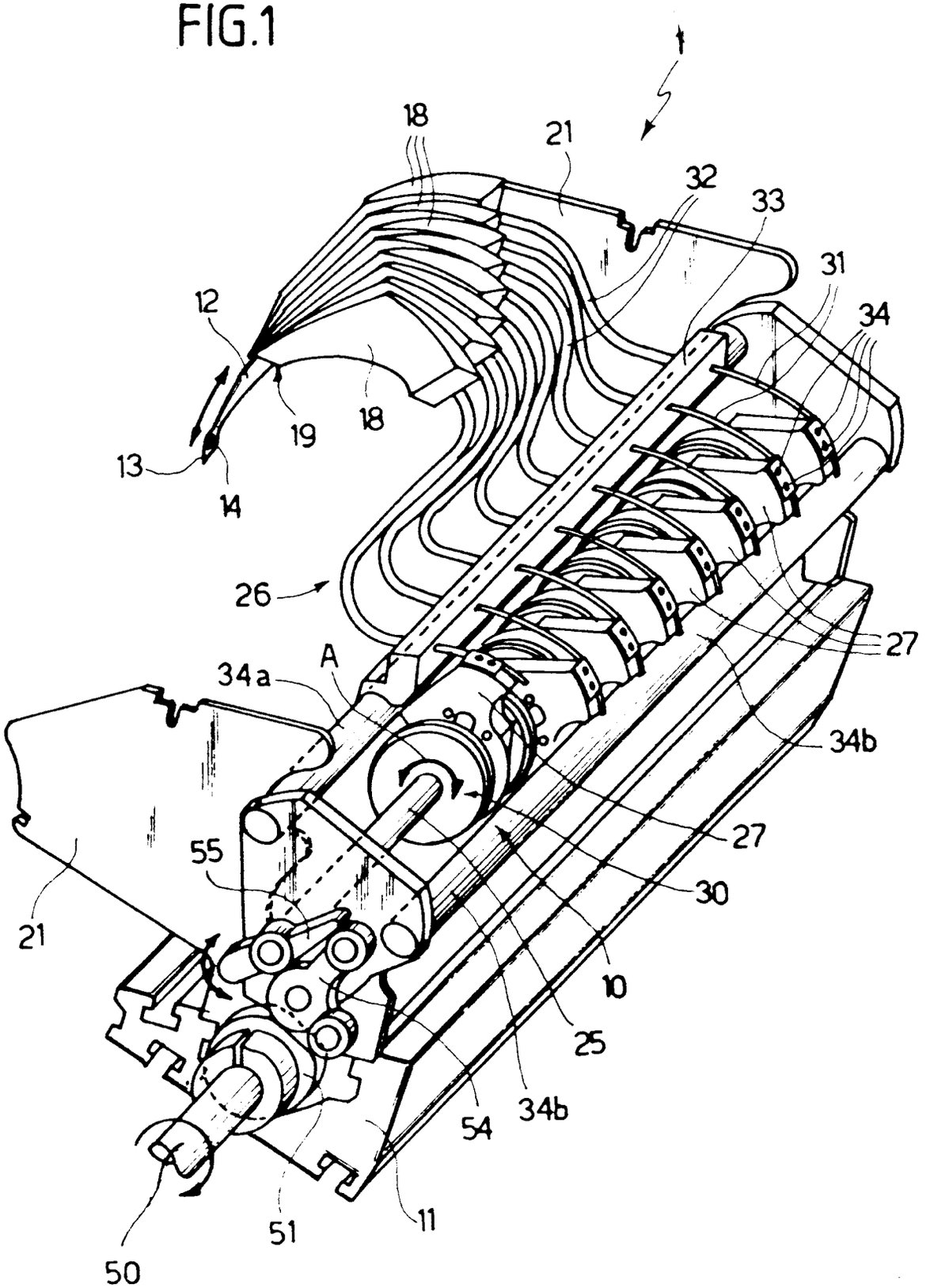
7. A device as claimed in any one of the foregoing Claims, characterized in that said friction clutches are electromagnetic and consist of respective electromagnetic disk brakes, each comprising a first circular element defining the armature and secured angularly integral with a first drive shaft of the device rotating back and forth over a predetermined arc, and a second circular element connected to a coil, defining the core, and fitted integral with a respective control element; said control element comprising a hub sector fitted idly to the first shaft and coaxial with the first shaft and with the first and second circular elements of the brake.

8. A device as claimed in Claim 7, characterized in that each said electromagnetic clutch is supplied by a fixed, flexible, metal conducting element enabling oscillation of the clutch along said arc and integrally with said first shaft, and connected removably to a supply socket fitted to the respective control element fitted with the core.

9. A device as claimed in Claim 7 or 8, characterized in that oscillation of said first drive shaft is controlled by a second drive shaft, parallel to the first and rotating in a predetermined direction, via a cam presenting a predetermined profile, fitted angularly integral with the second drive shaft, and cooperating with a first arm of a rocker arm mounted in oscillating manner parallel to said shafts, and a second arm of which cooperates with a finger angularly integral with the first drive shaft; the first drive shaft being operated by an independent motor synchronized with the loom motor, or directly by the loom motor via a mechanical transmission.

10. A device as claimed in Claim 7 or 8, characterized in that oscillation of said first drive shaft is controlled by an independent reversing motor synchronized with the loom and angularly connected directly to the first shaft.

FIG.1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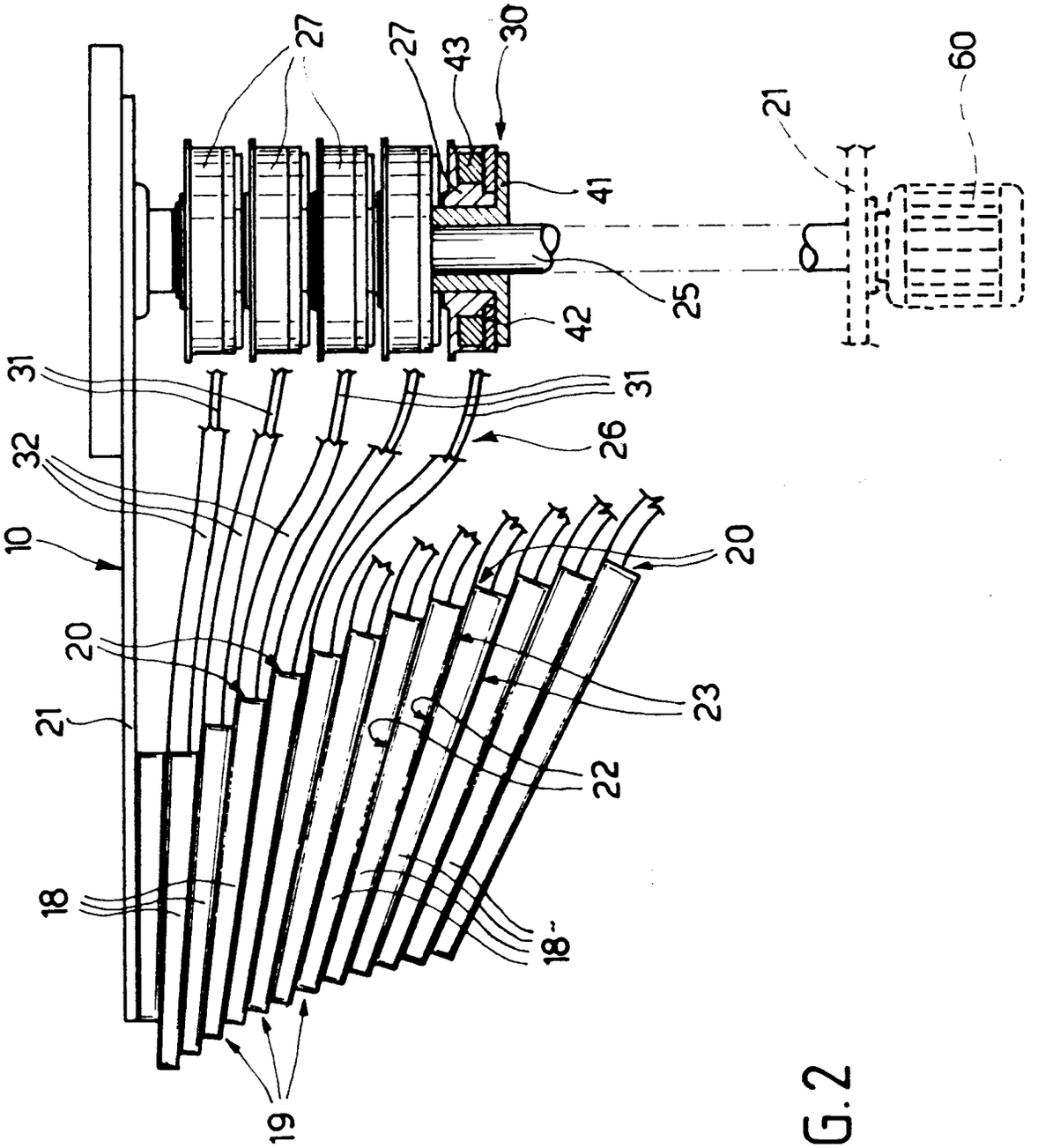
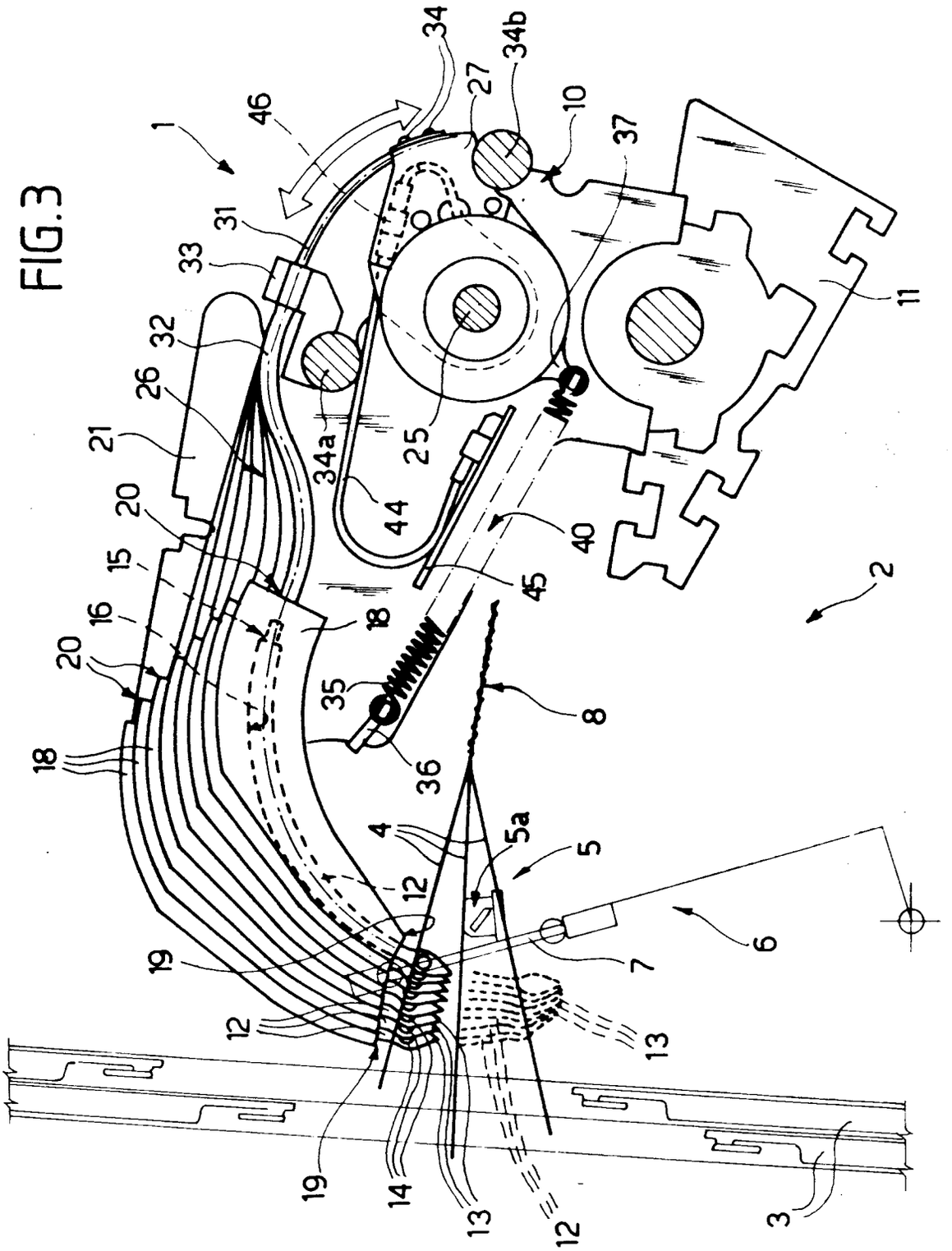


FIG.2

FIG.3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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 5032

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.6)
Y	EP-A-0 398 399 (PICANOL) * column 2, line 8 - column 3, line 30; figures *	1,2,7,9	D03D47/38
Y	EP-A-0 461 524 (VAMATEX) * column 4, line 20 - line 28; figure 2 *	1,2,7,9	
A	US-A-3 782 421 (BUDZYNA) * figures *	3-6	
A	GB-A-2 233 355 (NUOVOPIGNONE) * figures *	3	
A	DE-C-36 18 445 (LINDAUER DORNIER) * figures *	5,6	
A	EP-A-0 290 788 (PICANOL)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 July 1995	Rebiere, J-L

CATEGORY OF CITED DOCUMENTS

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