



(19)

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(11)

EP 0 724 032 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.07.1996 Bulletin 1996/31

(51) Int. Cl.⁶: D03C 3/20

(21) Application number: 95100976.0

(22) Date of filing: 25.01.1995

(84) Designated Contracting States:
DE FR GB IT

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(54) Thread selecting device for weaving machine

(57) A thread selecting device (2) for use with a weaving machine (3) is provided with a large number of thread selecting units (23,24) comprising for example a needle (4A,4B,25A,25B) that selects a thread (8) to be used by the machine (3), and a hook (6A,6B) driven by a solenoid (5) that supports the needle (4A,4B,25A,25B) in a raised position. This invention disposes adjacent solenoids (5) in a vertically staggered arrangement in the thread selecting device (2), thereby increasing the density of thread selecting units (23,24) and preventing the thread selecting device (2) from becoming bulky due to increase in the number of units.

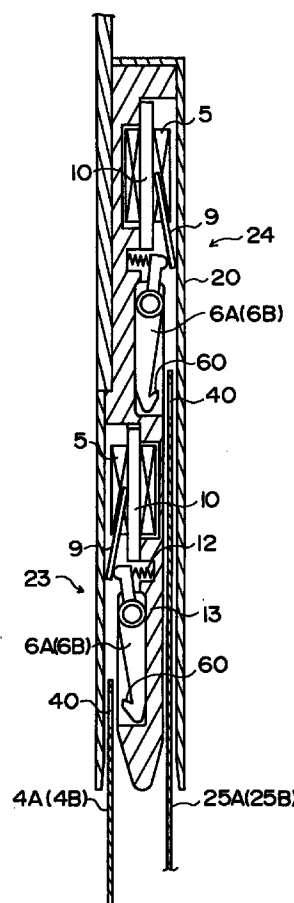


FIG. 4

EP 0 724 032 A1

Description

FIELD OF THE INVENTION

This invention relates to a thread selecting device whereby a weaving machine selects a thread according to a design or pattern of a woven article.

BACKGROUND OF THE INVENTION

In a weaving machine provided with a function for weaving a design or pattern, a thread selecting device such as, for example, a jacquard machine is used to select a thread according to the design to be woven.

As an example of a thread selecting device, Tokkai Hei 3-90646 published by the Japanese Patent Office for example discloses a device wherein a thread is selected using an electromagnetic solenoid type actuator driven by an electric signal.

This thread selecting device is provided above the body of the weaving machine, a knife being provided which rises and falls in conjunction with the operating cycles of the weaving machine.

The device moreover comprises numerous thread selecting units each consisting of a needle driven upwards by the knife, a hook that supports the needle in its raised position, and an electromagnetic solenoid that causes the hook to oscillate between the position for supporting the hook and a position wherein the hook is released.

The needle is connected to a thread via a number of mechanisms.

A thread is selected in the state when the needle is supported in the raised position, and the thread is deselected when the needle is released from the hook and descends. The knife rises on each operating cycle of the weaving machine, and lifts the needle. In the raised position of the needle, the hook engages with the needle when the solenoid is energized, and the needle is maintained in the raised position by the hook even after the knife has descended.

When the solenoid is not energized, on the other hand, the hook does not engage with the needle, so the needle and knife descend together.

By means of this mechanism, therefore, a required thread is selected from among a large number of candidate threads by selectively energizing the solenoid.

In the interior of the selecting device, a number of thread selecting units equivalent to the number of candidate threads are disposed adjacent to each other in two dimensions. Recently, however, due to increasing complexity of designs and patterns traced by weaving machines, the number of selecting units has been sharply increasing. The thread selecting device is consequently becoming very bulky, and it is becoming increasingly difficult to provide sufficient installation space.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to increase the installation density of thread selecting units.

It is a further object of this invention to prevent a thread selecting device from becoming bulky.

In order to achieve the above objects, this invention provides a thread selecting device for use with a weaving machine, comprising a large number of selecting units each comprising a needle that selects a thread used by the weaving machine according to whether the needle is in a raised or lowered position, a hook supporting the needle in the raised position, a solenoid that moves the hook between a position wherein it engages the needle and a position wherein it releases the needle according to the energizing state of the solenoid, and a transmission member driving the needle upwards at every operating cycle of the weaving machine. The device thereby selects a thread from a large number of candidate threads by selectively supplying an energizing current to the solenoid.

The device is characterized in that the solenoid and hook are disposed in a vertically staggered arrangement with respect to an adjacent solenoid and hook.

According to an aspect of this invention, the solenoids and hooks disposed in a vertically staggered arrangement, are contained in the same thread selecting unit.

According to another aspect of this invention, solenoids and hooks disposed in a vertically staggered arrangement, are contained in different thread selecting units.

According to yet another aspect of this invention, hooks disposed in a vertically staggered arrangement, are oriented in mutually opposing directions.

According to yet another aspect of this invention, the needle engaging with the hook disposed in the upper part of the device, is formed longer than the needle engaging with the hook disposed in the lower part of the device.

The details as well as other features and advantages of this invention are set forth in the remainder of the specification and are shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of a weaving machine provided with a thread selecting device according to this invention.

Fig. 2 is a schematic side view of the thread selecting device.

Fig. 3 is a vertical sectional view of a thread selecting unit according to this invention.

Fig. 4 is a vertical sectional view of the essential parts of the thread selecting unit viewed from a direction perpendicular to that of Fig. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1 of the drawings, a thread selecting device 2 is installed above a weaving machine 3, the device 2 being provided with a shaft 34 that operates in conjunction with a shaft 30 for driving the weaving machine 3.

As shown in Fig. 2, the shaft 34 is connected to knives 7A, 7B that function as drive members via a cam 31, arm 32 and link mechanism 33, this shaft 34 alternately raising and lowering the knives 7A, 7B in synchronism with the weaving cycles of the weaving machine 3.

When the knives 7A, 7B are raised, they drive the needles 4A, 4B upwards respectively as shown in Fig. 3. Engaging holes 40 are formed in the upper ends of the needles 4A, 4B. Control threads 22 are connected to their lower ends, a common pulley 21 being suspended from the threads 22, and a thread 8 is also connected to the pulley 21. When the needles 4A, 4B are both in their raised positions, the thread 8 is pulled up via the pulley and is thereby selected. On the other hand, when either one of the needles 4A, 4B is in its lowered position, the thread 8 is not pulled up and is thereby deselected. As the knives 7A, 7B rise and fall alternately, moreover, the needles 4A, 4B never descend together.

A hook 6A is supported free to pivot on a hinge 13 above the knife 7A, and a hook 6B is supported free to pivot on the hinge 13 adjacent to the hook 6A above the knife 7B. The hooks 6A, 6B pivot according to the energizing of a solenoid 5 installed above them.

The hooks 6A, 6B are driven by the solenoid 5 via a mechanism shown in Fig. 4.

The exciting solenoid 5 attracts an armature 9 toward a yoke 10. The hook 6A (6B), which is pushed by a spring 12 above the hinge 13, therefore comes into contact with the armature 9. Due to the attraction of the armature 9 to the yoke 10, the hook 6A (6B) pivots against the force of the spring 12, and a claw 60 at its lower end moves to a forward position. On the other hand, when the energizing of the solenoid 5 stops, the hook 6A pivots so as to push the armature 9 away due to the force of the spring 12, and the claw 60 moves to a retracted position.

When the solenoid 5 is energized in the raised position of the needle 4A (4B), the hook 6A (6B) pivots the claw 60 into its forward position so that the claw 60 enters the engaging hole 40 of the needle 4A (4B). After the knife 7A (7B) has descended, therefore, the needle 4A (4B) remains in its raised position.

When the energizing of the solenoid 5 is stopped, the hook 6A (6B) which is not supporting the needle 4A (4B) pivots the claw 60 into its retracted position, while the hook 6A (6B) which is supporting the needle 4A (4B) remains in its forward position even after the energizing of the solenoid 5 is stopped. In the next cycle, however, if the solenoid 5 is not energized, the hook 6A (6B)

which has supported the needle 4A (4B) pivots the claw 60 into its retracted position, and needle 4A (4B) is thereby released from the hook 6A (6B) so that it descends.

The hook 6A and 6B move according to the energizing of the common solenoid 5. If either the needle 4A or 4B is supported in its raised position by the hook 6A or 6B, the thread 8 is pulled up via the pulley 21 and selected when the other needle is raised. Also, if the claws 60 of the hook 6A and 6B are in their retracted positions, the other needle descends when either of the needles 4A, 4B is raised, so the thread 8 is not pulled up and is thereby deselected.

The single solenoid 5 is therefore sufficient to operate the two hooks 6A, 6B, although solenoids may also be provided separately for each hook.

The supply and interruption of energizing current to the solenoids 5 is controlled by a controller 1 shown in Fig. 1. The aforesaid needles 4A, 4B, solenoid 5, and hooks 6A, 6B together comprise a thread selecting unit 23.

A thread selecting unit 24 having the same construction as that of the thread selecting unit 23, is installed above the unit 23. The thread selecting unit 24 comprises needles 25A, 25B, a solenoid 5, and hooks 6A, 6B. The solenoid 5 and hooks 6A, 6B are precisely the same as those used in the thread selecting unit 23.

The thread selecting units 23, 24 are installed in a staggered vertical alignment inside a common holder 20.

In other words, the thread selecting unit 24 is disposed effectively directly above the thread selecting unit 23, and the claws 60 of the hooks 6A (6B) are oriented backwards in each unit. The attraction of the armatures 9 by the solenoids 5 is therefore also oriented backwards. According to this arrangement the total projected surface area of the selecting units 23, 24 is effectively the same as that of a single unit alone.

The needles 25A, 25B of the selecting unit 24 are longer than the needles 4A, 4B of the selecting unit 23 by an amount corresponding to the vertical interval between the units 23 and 24.

The thread selecting device comprises selecting units 23, 24 consisting of large numbers of pairs formed as described hereintofores.

The operating principle of the units 23, 24 is the same, corresponding threads 8 being raised and selected by the solenoids 5.

Only the solenoid 5 corresponding to a thread 8 that it is desired to select is therefore energized, the other solenoids 5 not being energized. In this way, any desired thread may be selected from a large number of candidate threads.

The units 23, 24 operate completely independently of each other inside the common holder 20, and as they are housed in the holder 20 in a staggered vertical arrangement, the space they occupy is effectively no different from the space that would be occupied by one unit 23 (24) alone. Compared to the conventional

arrangement wherein the units were disposed adjacent to each other, therefore, far less space is occupied by the selecting units, and the plan dimensions of a thread selecting device containing a requisite number of selecting units are consequently smaller. In other words, more selecting units can now be contained within the same space, so it is possible to weave complex patterns that make use of large numbers of the threads 8.

According to the aforesaid embodiment, the selecting units 23, 24 driving different threads 8 were disposed in a staggered vertical arrangement, however if the hooks 6A, 6B in the same unit are driven by different solenoids as mentioned hereinabove, the space occupied by the unit can also be reduced by vertically staggering the solenoids inside the unit in the same way.

The embodiments of this invention in which an exclusive property or privilege is claimed are defined as follows:

Claims

1. A thread selecting device (2) for use with a weaving machine (3), comprising a large number of selecting units (23, 24) each comprising a needle (4A, 4B, 25A, 25B) that selects a thread (8) used by the weaving machine (3) according to whether said needle is in a raised or lowered position, a hook (6A, 6B) supporting said needle (4A, 4B) in the raised position, a solenoid (5) that moves said hook (6A, 6B) between a position wherein it engages said needle (4A, 4B, 25A, 25B) and a position wherein it releases said needle according to the energizing state of said solenoid, and a transmission member (7A, 7B) driving said needle (4A, 4B, 25A, 25B) upwards at every operating cycle of the weaving machine (3), said device selecting the thread (8) from a large number of candidate threads by selectively supplying an energizing current to said solenoid (5), characterized in that said solenoid (5) and hook (6A, 6B) are disposed in a vertically staggered arrangement with respect to an adjacent solenoid (5) and hook (6A, 6B).
2. A thread selecting device (2) as defined in claim 1, wherein said solenoids (5, 5) and hooks (6A, 6B, 6A, 6B) disposed in a vertically staggered arrangement, are contained in the same thread selecting unit (23).
3. A thread selecting device (2) as defined in claim 1, wherein said solenoids (5, 5) and hooks (6A, 6B, 6A, 6B) disposed in a vertically staggered arrangement, are contained in different thread selecting units (23, 24).
4. A thread selecting device (2) as defined in claim 1, wherein said hooks (6A, 6B, 6A, 6B) disposed in a vertically staggered arrangement, are oriented in mutually opposing directions.
5. A thread selecting device (2) as defined in claim 1, wherein said needle (25A, 25B) engaging with said hook (6A, 6B) disposed in the upper part of the device, is formed longer than said needle (4A, 4B) engaging with said hook (6A, 6B) disposed in the lower part of the device.

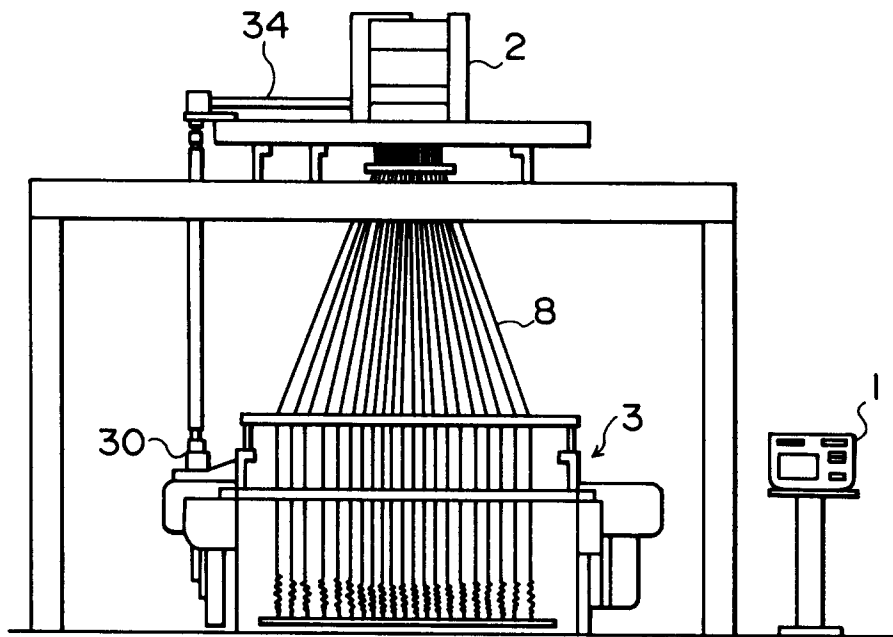


FIG. 1

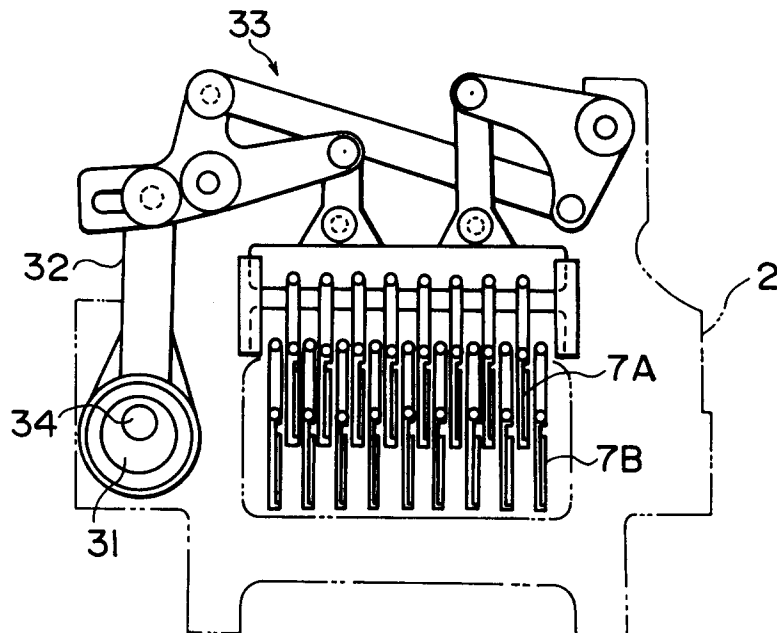


FIG. 2

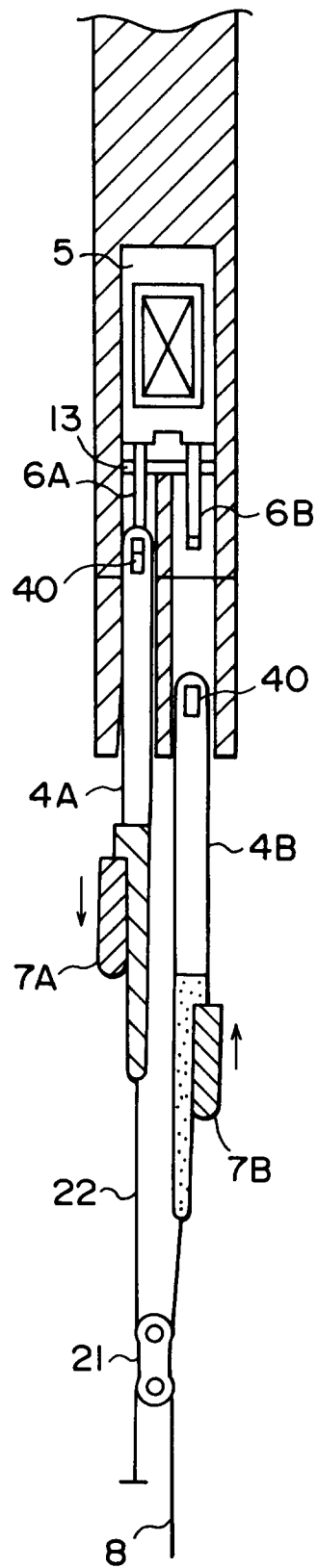


FIG. 3

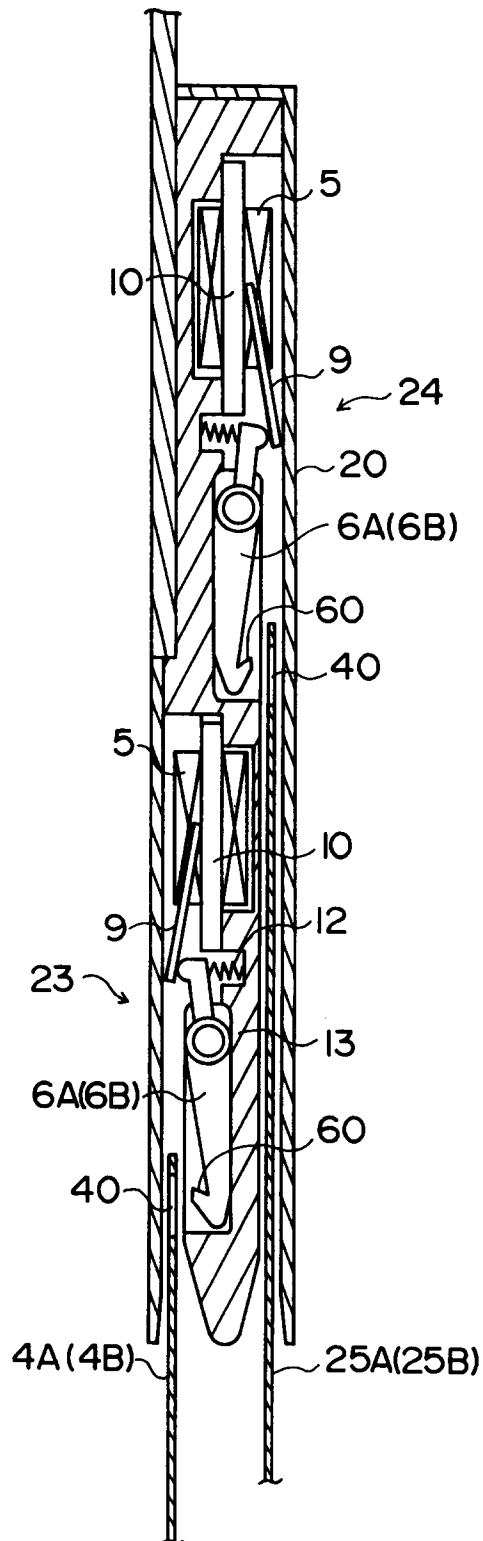


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 0976

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)
A	EP-A-0 287 921 (GROSSE) * the whole document *	1	D03C3/20
A	EP-A-0 382 998 (K.K.TAKEMURA SEISAKUSHO)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D03C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 June 1995	Examiner Boutelegier, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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