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(54) **Thread selecting device for weaving machine**

Fadenwahlvorrichtung für Webmaschinen

Dispositif de sélection de fil pour métier à tisser

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(56) References cited:
EP-A- 0 287 921 **EP-A- 0 382 998**

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Description

FIELD OF THE INVENTION

[0001] 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

[0002] 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.

[0003] 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.

[0004] 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.

[0005] 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.

[0006] The needle is connected to a thread via a number of mechanisms.

[0007] 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.

[0008] 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.

[0009] By means of this mechanism, therefore, a required thread is selected from among a large number of candidate threads by selectively energizing the solenoid.

[0010] 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

[0011] It is therefore an object of this invention to increase the installation density of thread selecting units.

[0012] It is a further object of this invention to prevent a thread selecting device from becoming bulky.

[0013] 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.

[0014] 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.

[0015] 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.

[0016] According to another aspect of this invention, solenoids and hooks disposed in a vertically staggered arrangement, are contained in different thread selecting units.

[0017] According to yet another aspect of this invention, hooks disposed in a vertically staggered arrangement, are oriented in mutually opposing directions.

[0018] 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.

[0019] 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

[0020] Fig. 1 is a side view of a weaving machine provided with a thread selecting device according to this invention.

[0021] Fig. 2 is a schematic side view of the thread selecting device.

[0022] Fig. 3 is a vertical sectional view of a thread selecting unit according to this invention.

[0023] 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

[0024] 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.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] The hooks 6A, 6B are driven by the solenoid 5 via a mechanism shown in Fig. 4.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] The single solenoid 5 is therefore sufficient to operate the two hooks 6A, 6B, although solenoids may also be provided separately for each hook.

[0034] 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.

[0035] 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.

[0036] The thread selecting units 23, 24 are installed in a staggered vertical alignment inside a common holder 20.

[0037] 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.

[0038] 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.

[0039] The thread selecting device comprises selecting units 23, 24 consisting of large numbers of pairs formed as described hereintofo.

[0040] The operating principle of the units 23, 24 is the same, corresponding threads 8 being raised and selected by the solenoids 5.

[0041] 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.

[0042] 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.

[0043] 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.

[0044] 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.

Patentansprüche

1. Eine Fadenwahlvorrichtung (2) zur Verwendung mit einer Webmaschine (3), die eine große Anzahl Wahleinheiten (23, 24) umfaßt, von denen jede eine Nadel (4A, 4B, 25A, 25B) umfaßt, die einen Faden (8) auswählt, der von der Webmaschine (3) nach Maßgabe davon verwendet wird, ob die genannte Nadel in einer angehobenen oder abgesenkten Position ist, einen Haken (6A, 6B), der die genannte Nadel (4A, 4B) in der angehobenen Position hält, ein Solenoid (5), das den genannten Haken (6A, 6B) gemäß dem Erregungszustand des genannten Solenoids zwischen einer Position, in der er an der genannten Nadel (4A, 4B, 25A, 25B) eingreift, und einer Position bewegt, in der er die genannte Nadel freigibt, und ein Übertragungselement (7A, 7B), das die genannte Nadel (4A, 4B, 25A, 25B) bei jedem Arbeitszyklus der Webmaschine (3) aufwärtsbewegt, wobei die genannte Vorrichtung den Faden (8) aus einer großen Anzahl Kandidatenfäden auswählt, indem selektiv ein Erregungsstrom dem genannten Solenoid (5) zugeführt wird, **dadurch gekennzeichnet**, daß das genannte Solenoid (5) und der Haken (6A, 6B) in einer vertikal gestapelten Anordnung in bezug auf ein benachbartes Solenoid (5) und Haken (6A, 6B) angeordnet sind.
2. Eine Fadenwahlvorrichtung (2), wie in Anspruch 1 beansprucht, wobei die genannten Solenoide (5, 5) und Haken (6A, 6B, 6A, 6B), die in einer vertikal gestapelten Anordnung angeordnet sind, in derselben Fadenwahleinheit (23) enthalten sind.
3. Eine Fadenwahlvorrichtung (2), wie in Anspruch 1 beansprucht, wobei die genannten Solenoide (5, 5) und Haken (6A, 6B, 6A, 6B), die in einer vertikal gestapelten Anordnung angeordnet sind, in verschiedenen Fadenwahleinheiten (23) enthalten sind.
4. Eine Fadenwahlvorrichtung (2), wie in Anspruch 1 beansprucht, wobei die genannten Solenoide (5, 5) und Haken (6A, 6B, 6A, 6B), die in einer vertikal gestapelten Anordnung angeordnet sind, in gegenseitig entgegengesetzten Richtungen ausgerichtet sind.

5. Eine Fadenwahlvorrichtung (2), wie in Anspruch 1 definiert, wobei die genannte Nadel (25A, 25B), die an dem genannten Haken (6A, 6B) eingreift, der in dem oberen Teil der Vorrichtung angeordnet ist, länger als die genannte Nadel (4A, 4B) gebildet ist, die an dem genannten Haken (6A, 6b) angreift, der in dem unteren Teil der Vorrichtung angeordnet ist.

de façon à être plus longue que ladite aiguille (4A, 4B) s'engageant dans ledit crochet (6A, 6B) disposé dans la partie inférieure du dispositif.

Revendications

1. Un dispositif de sélection de fil (2), destiné à être utilisé avec un métier à tisser (3) comprenant un grand nombre d'unités de sélection (23, 24) comprenant chacune une aiguille (4A, 4B, 25A, 25B) qui sélectionne un fil (8) utilisé par le métier à tisser (3) selon le fait que ladite aiguille se trouve dans une position levée ou abaissée, un crochet (6A, 6B) supportant ladite aiguille (4A, 4B) dans la position levée, un solénoïde (5) qui déplace ledit crochet (6A, 6B), entre une position dans laquelle il s'engage dans ladite aiguille (4A, 4B, 25A, 25B) et une position dans laquelle il libère ladite aiguille d'après l'état d'activation dudit solénoïde, et un organe de transmission (7A, 7B) entraînant ladite aiguille (4A, 4B, 25A, 25B) vers le haut à chaque cycle de fonctionnement du métier à tisser (3), ledit dispositif sélectionnant le fil (8) à partir d'un grand nombre de fils candidats, en fournissant sélectivement un courant d'activation audit solénoïde (5), caractérisé en ce que
ledit solénoïde (5) et le crochet (6A, 6B) sont disposés selon un agencement verticalement décalé par rapport à un solénoïde (5) adjacent et le crochet (6A, 6B).
2. Un dispositif de sélection de fils (2) selon la revendication 1, dans lequel lesdits solénoïdes (5, 5) et les crochets (6A, 6B, 6A, 6B) disposés selon un agencement verticalement décalé sont contenus dans la même unité de sélection de fils (23).
3. Un dispositif de sélection de fils (2) selon la revendication 1, dans lequel lesdits solénoïdes (5, 5) et les crochets (6A, 6B, 6A, 6B) disposés selon un agencement verticalement décalé sont contenus dans différentes unités de sélection de fils (23, 24).
4. Un dispositif de sélection de fils (2) selon la revendication 1, dans lequel lesdits crochets (6A, 6B, 6A, 6B) disposés selon un agencement verticalement décalé sont orientés dans des directions mutuellement opposées.
5. Un dispositif de sélection de fils (2) selon la revendication 1, dans lequel ladite aiguille (25A, 25B) s'engageant dans ledit crochet (6A, 6B) disposé dans la partie supérieure du dispositif, est formée

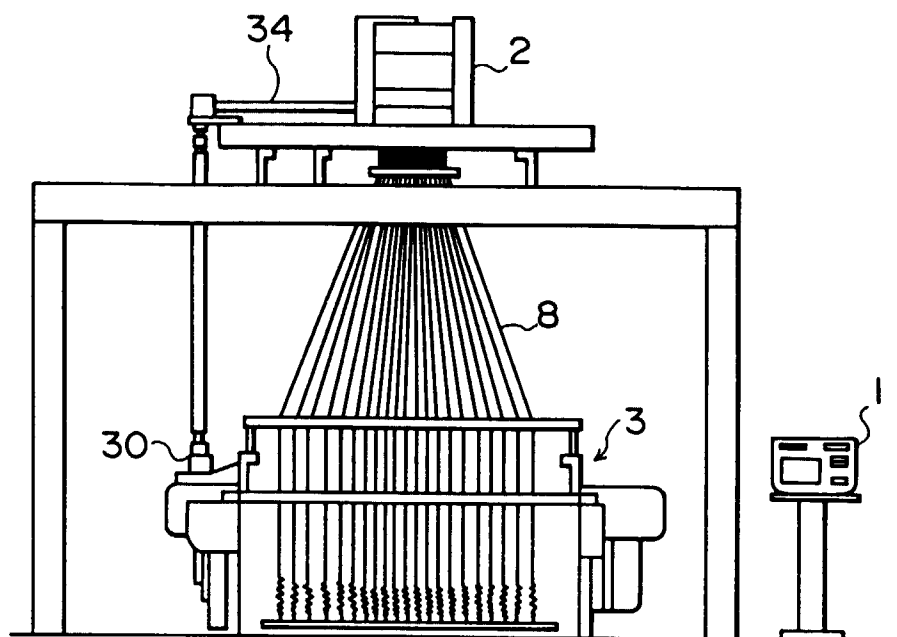


FIG. 1

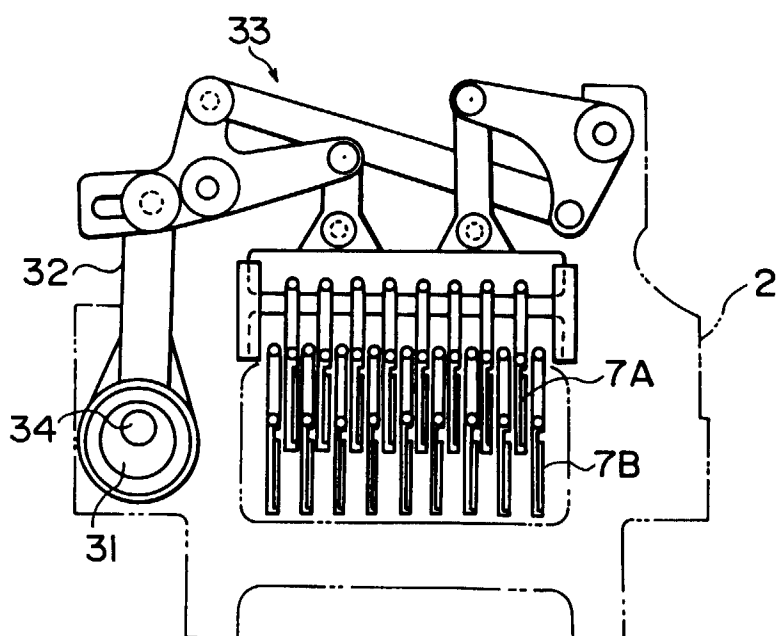


FIG. 2

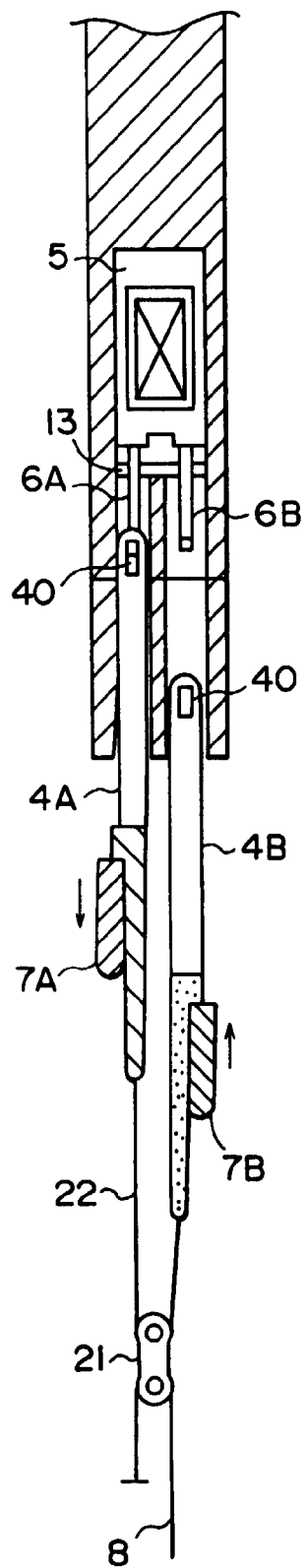


FIG. 3

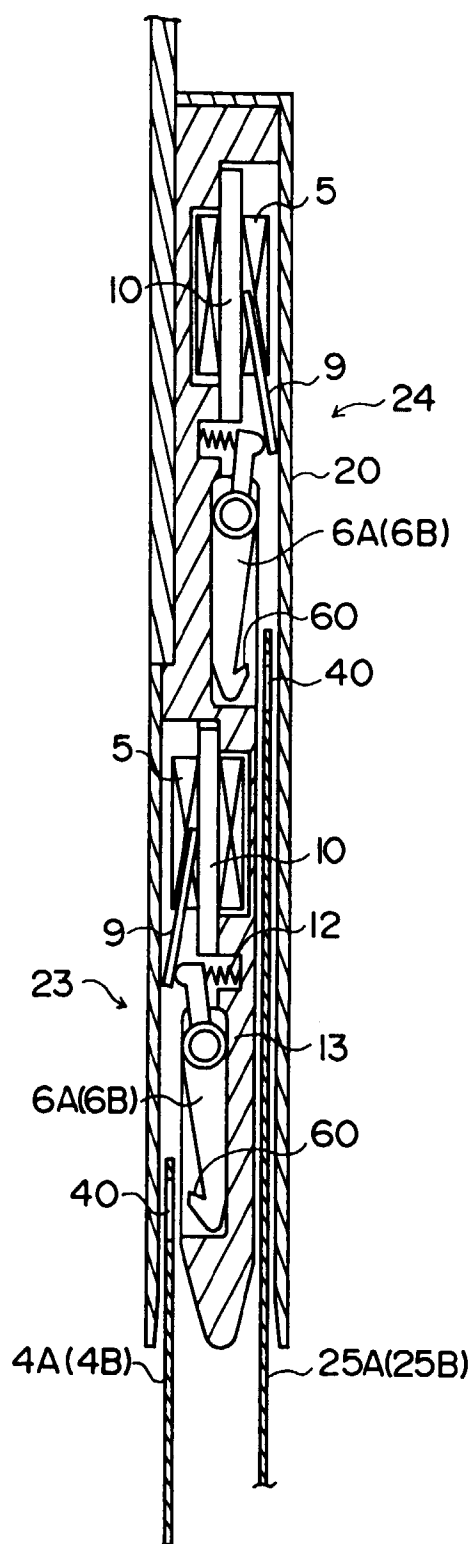


FIG. 4