

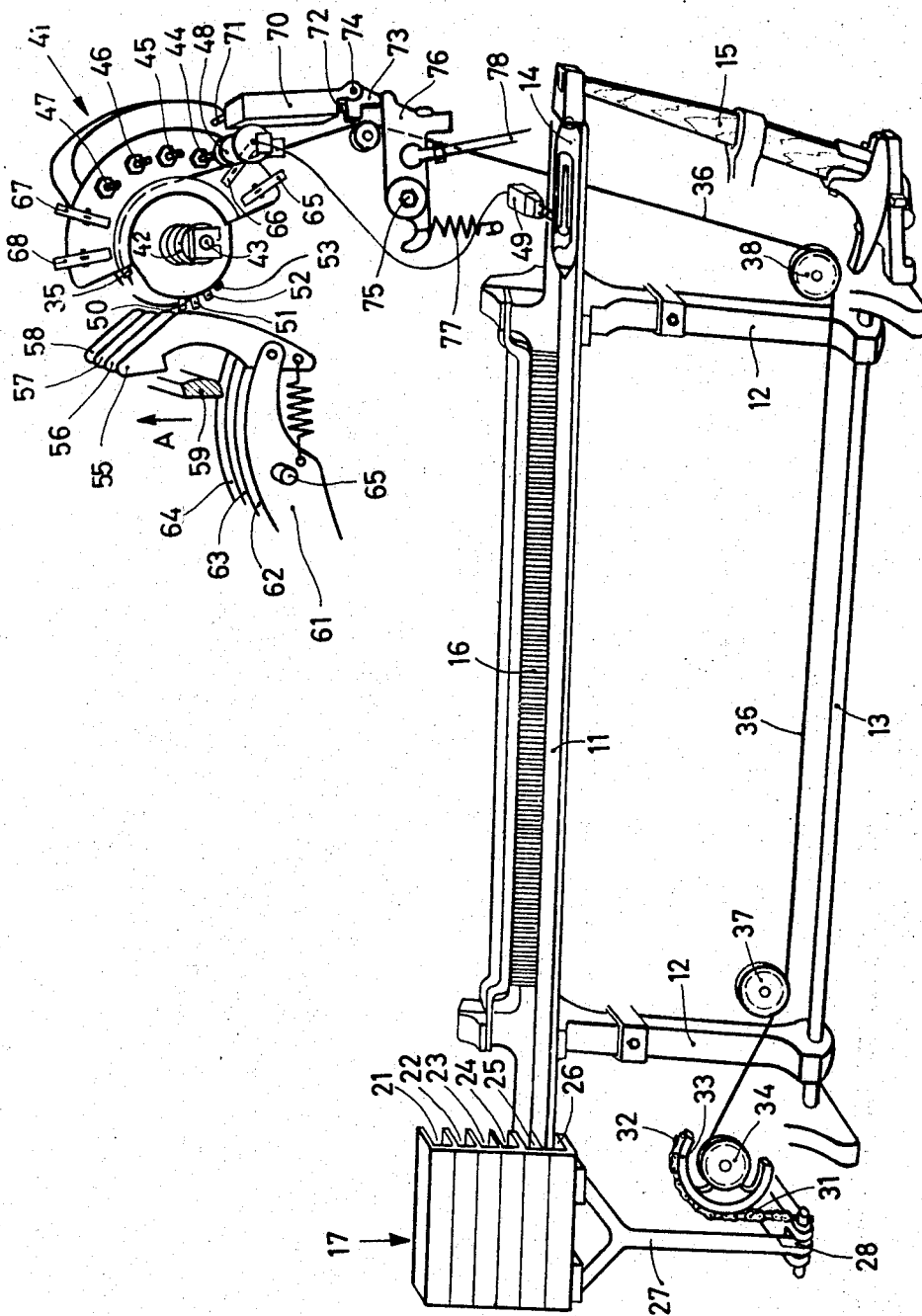
Oct. 10, 1967

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3,346,018

ARRANGEMENT FOR AUTOMATIC AND MANUAL BOBBIN CHANGING

Filed March 3, 1966



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ARRANGEMENT FOR AUTOMATIC AND MANUAL BOBBIN CHANGING

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Filed Mar. 3, 1966, Ser. No. 531,615

Claims priority, application Switzerland, Apr. 2, 1965,
4,598/65

9 Claims. (Cl. 139—232)

ABSTRACT OF THE DISCLOSURE

A bobbin-changing arrangement on a weaving loom comprising an adjustable shuttle box with a plurality of box compartments for shuttles carrying different yarns, a control device having a plurality of first elements for the automatic control of the bobbin-changing operation of a group of the compartments in accordance with data supplied by yarn monitoring means indicating the necessity for a bobbin change, each compartment of the group being associated with one of said first elements in such a manner that in operation only compartments and elements associated with each other are simultaneously in their working positions and additional second elements positioned on both sides of said first elements for effecting shutdown of the weaving loom, the number of said second elements on each side being equal to the difference obtained from the total number of box compartments in the shuttle box minus the number of box compartments corresponding to those in the group having an automatic bobbin-changing operation, and the association of the box compartments with said elements being capable of being varied to permit variations in the selection of the box compartments which are in the group having an automatic bobbin-changing operation.

The present invention relates to a bobbin-changing arrangement on a weaving loom having an adjustable shuttle box provided with a multiplicity of compartments for shuttles carrying different kinds of yarns and a control device having a plurality of elements for effecting automatic control of a bobbin change in response to a yarn monitoring device, each compartment being so associated with each element that in operation only compartments and elements which are associated with each other are simultaneously located in their working position.

Weaving looms are known on which different kinds of yarns, particularly yarns of varying color, are woven. In such weaving looms for each kind of yarn sort there is provided a special shuttle containing a bobbin of the selected kind of yarn. These looms have shuttle or riser boxes containing a plurality of compartments, the number of compartments corresponding to the number of shuttles available. A programming device determines which yarn is to be picked for every pick; the compartment of the appropriate shuttle being put into the picking position of the picker stick.

When the thread or yarn supply of a bobbin has been completely depleted on an automatic weaving loom, a monitoring device controls a device for automatically changing the bobbin. The monitoring device and the bobbin changing device are disposed on the opposite side of the sley race relatively to the shuttle box. If the monitoring device indicates the necessity of a bobbin change, automatic changing of the bobbin does not take place immediately; the shuttle with the almost empty bobbin being first urged back into the shuttle box. Only after the next passage through the shed, i.e., when the shuttle is again on that side of the weaving loom on which the bobbin

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changing device is located, does the actual bobbin-changing operation take place.

When the shuttle is in the shuttle box, immediately after a signal or an indication has been received that a bobbin is almost empty, the program of the following pick may require a yarn of a color differing from that which has been indicated as being practically depleted. In this case, it is necessary that the signal or indication be stored until the shuttle with the almost empty bobbin is again required and is again disposed on the side of the loom having the bobbin changing device. Storage of the signal is effected by means of a device often called a pre-selector.

Multi-color automatic weaving looms such as are presently used normally have shuttle boxes containing four compartments, i.e., with these machines it is possible to weave a cloth from four different weft yarns, each having a different color. If more than four different yarn sorts are to be used as weft threads, then the shuttle box must have more than four compartments. Such automatic weaving looms are also already known. If, instead of four colors, for example, six are used, experience has shown that as a rule, two of the compartments are seldom used in practice. Often it is only necessary to use one to two bobbins in these compartments per day.

Since the yarn bobbins in the supply magazine attached to the loom are continuously subjected to oscillation by the working loom, the yarn on the little used bobbins is damaged due to its relatively long period of stay in the magazine.

The provision of an automatic mechanism for producing cloth having six colors is substantially more complicated than the provision of a mechanism for four colors. It is necessary to provide supplementary magazine compartments having appropriate bobbin tripping flips for the additional colored yarns. Such a mechanical arrangement must be equipped with the supplementary levers necessary for actuating these additional flips. The conduit conveying the bobbins from the magazine compartment to the picking point becomes excessively long and the wiper moving the bobbin through the conduit must be moved more quickly at a proportionally greater rate. Thus, especially in the case of high-speed machines, the weight of the wiper must be increased. Also due to the higher velocity of the wiper, its recoil is increased when it reaches the picking point. Consequently, the possibility of inaccurate bobbin positioning as well as the chances of faulty bobbin changing are increased. To sum up, it must be said that with an increasing number of shuttles in automatic bobbin changing, the additional expenditure rapidly increases, so that the automatic mechanism becomes uneconomical with increasing numbers of colors, particularly if a certain proportion of the colors is seldom used in the cloth pattern.

The invention obviates these disadvantages by an arrangement whereby there are provided on both sides of certain first elements, additional second elements which serve for the shutting down of the weaving loom, the number of the said second elements on each side being equal to the difference obtained from the total number of box compartments minus the number of box compartments corresponding to the automatic bobbin changing operation; the association of the box compartments with the elements being variable. The shutting down of the weaving loom by means of the second elements thus indicating to the weaving foreman that the bobbin is empty so that he will readily be able to manually replace the bobbin.

It would per se be possible to leave the bobbins which are not automatically changed in operation until the weft stop motion stops the loom because no more weft thread is being picked into the shed. This, however, would mean that in a case of this kind it would be necessary practically

every time to rotate the loom back in order to again remove a part of a picked thread and in order to again adjust the correct shed.

It is a further advantage of the present invention that, in consequence of the second control elements available on both sides of the first element, particularly in connection with the variable association thereof, that the number of possible arrangements of shuttles carrying different yarns in the shuttle box permits the operator preparing the program for a specific cloth pattern to make the magnitude of the shuttle box movements the same as that with a corresponding fully automatic and substantially more expensive bobbin changing device. This will now be discussed in greater detail with reference to an example; assuming that four shuttle box compartments are provided, each having bobbins that are automatically changed and the shuttle box has two additional shuttle compartments having bobbins that are changed by hand. Then, the storage device, i.e. the pre-selector, has in each case on both sides of the first elements serving to effect automatic bobbin changing two second elements for manual bobbin changing. Because of the fact that the second elements are provided on both sides of the first elements, the two shuttle box compartments having the shuttles for manual operation may be associated either with the second elements disposed on the one side or with the second elements disposed on the other side or with the two inner ones of the second elements. The diminution resulting therefrom in the shuttle box movements will be apparent from the following description:

Assuming that, with a pre-determined pattern, the four main colors are brown, yellow, blue and red, alternating once in the sequence indicated and then in the reverse sequence. In this case, these main colors are arranged in the above-indicated sequence in four adjacent compartments. This provides shuttle box movements of minimum distance. If then, also green and black are to be picked in small pick numbers, and if strips of these colors are to be interposed between the brown color, then these two colors will be positioned in the two compartments arranged at the end of the shuttle box and adjacent the compartment containing the "brown" shuttle. The four compartments containing the main colors are associated with the first elements and the two compartments containing the seldom-used colors are associated with the two second elements disposed on the side adjacent the first element associated with the "brown" shuttle. If, on the other hand, a black strip is to be interposed between two brown strips and green strips are to be between the two red strips, then these colors will be accommodated in the two outer-most box compartments, i.e. "green" shuttle adjacent the "red" shuttle and "black" shuttle adjacent the "brown" shuttle and the inner ones of the two control elements will be correspondingly associated with these compartments. It is clear from this example that, with the arrangement of the second elements according to the invention, the box movements in both the cases just described in respect of the arrangement of colors in the cloth, are reduced to a minimum, i.e. the result achieved is that there are in every case only movements between adjacent box compartments. In the case of other cloth color patterns, corresponding conditions are obtained.

The invention will now be discussed in greater detail with reference to an example of one embodiment and with reference to the drawing in which FIGURE 1 shows a perspective view of a diagrammatic representation of the arrangement of the invention on a weaving loom.

Referring to the drawing, the sley 11 of the weaving loom is carried by two supports 12. Due to the drive of the supports, the sley 11 is periodically displaced forwardly and rearwardly. Simultaneously, the sley supports 12 rotate about the pivotal axis 13. Picking of the weft yarn into the shed formed by the warp threads (not shown) is effected by means of shuttles. One of which is shown as shuttle 14. The shuttles are driven by two picker sticks.

However, only the picker stick 15 is shown in the drawings. The picker stick provided on the other side of the sley 11 is not shown, in order to keep the diagrammatic representation of the invention clear. Reed 16 beats up the weft yarn.

The arrangement illustrated in the drawing is intended to be used for weaving with weft yarns of different kinds. For this purpose, there is a shuttle box 17 having six compartments 21 to 26, respectively. Associated with each of the compartments is a shuttle having a bobbin of a pre-determined yarn sort, for example a pre-determined color. In the working phase shown in the drawing, the shuttle 14 is associated with the compartment 25. If the color of the weft yarn to be picked is to be changed, then the shuttle box 17 is (during the interval of time in which all the shuttles are in the box 17) moved upwardly or downwardly by a distance which is such that the shuttle box compartment with the shuttle of the desired color is displaced to the height of the sley race 11 into its working position, i.e. into the position of compartment 25 shown in FIGURE 1. The shuttle box 17 is supported by the carrier 27. Secured to the lower end 28 of the carrier is a chain 31 which is secured at its other end to the ring sector-shaped member 33. The member 33 is rigidly connected with the pulley 34 which rotates about its axis and to which one end of a rope or cable 36 is secured. The rope 36 is guided over the pulleys 37 and 38 and its other end is secured by means of a fastening means 35 to the pre-selector 41.

Spiral spring 42 endeavors to rotate the pre-selector 41 which is rotatable about the pivot 43 in a clockwise direction. Due to the coupling of the shuttle box 17 by means of the chain 31 and the rope 36 and because of the pre-tension imparted by the spiral spring 42, the pre-selector 41 moves exactly in correspondence with the shuttle box 17. The pre-selector 41 has four pins, or elements 44 to 47 respectively, which are movable in their axial direction.

The pins are, if they are positioned precisely before the electromagnet 48, i.e. in their working position, adapted to be actuated by the magnet so that in the present example they are adapted to be pressed in. The actuation of the magnet 48 is controlled by the yarn feeler or monitoring means 49. This means responds or operates when the yarn supply of the bobbin of a shuttle 14 disposed on the right hand side of the sley 11 is practically exhausted. As a result of the actuation of one of the pins 44, 45, 46 or 47, an indication of the necessity for the changing of a bobbin is stored in the pre-selector and an automatic bobbing change takes place on the next arrival of the shuttle associated with the specific bobbin on the right hand side of the sley. Each of the pins 44 to 47 is operatively associated with one of the projections or cams 50 to 53, respectively, and each of the cams 50 to 53 is operatively associated with one of the hooks 55 to 58, respectively. On actuation of one of the pins 44 to 47, the corresponding or associated projection 50 to 53 is moved outwardly from the interior of the pre-selector 41.

When one of the pins 44 to 47 is in its working position, i.e. before the magnet 48, the corresponding cam of the cams 50 to 53 is disposed before the hook with which it is associated. This means that each of the cams 50, 51, 52 and 53 is in the plane determined by the hook associated with it and moves in this plane on rotation of the pre-selector 41 about the pivot 43. If one of the cams is in its moved-out position and the pin 44 to 47 which corresponds to it is in its operative position before the magnet 48, the projection or cam presses the hook associated with it into the path of movement of the blade or knife 59. The blade 59 is displaced in the direction of the arrow A and in the opposite direction relatively thereto during each work cycle. The movement of the blade 59 is temporarily so selected that, on actuation of the pre-selector 41 by the yarn monitoring means 49, entrainment by the blade 59 does not take place immediately

but only after the corresponding shuttle is, on the next occasion, urged on to the right hand loom side. Coupled with each hook is one of the levers 61 to 64. The levers 61 to 64 are each pivotal about the pivot 65 and bring about, by means which are now shown, the automatic bobbin change in respect to the appropriate yarn sort of a specified color.

If for example, as shown in the drawing, the shuttle box compartment 25 is at the height of the sley 11, then the coupling by means of the chain 31 and the rope 36 is so adjusted that the pin 44 is in its working position, i.e. before the magnet 48. In this position of the pre-selector 41, the cam 50 is in a position such that this cam and only this cam, in the moved out position, is able to move the hook associated with it into the path of movement of the blade 59. Hook 55 is associated with the cam 50 and is also connected in articulated or link-like manner with the lever 61.

If the bobbin of the shuttle associated with box compartment 25 carries practically no more yarn, then the magnet 48 is actuated so that the pin 44 is pressed in and the cam 50 is displaced into its moved out position. In this phase of the working cycle of the weaving loom the blade 59 is already in its upper position so that the corresponding hook 55 is no longer raised. The shuttle 14 is then again urged towards the left into its shuttle box compartment 25. If the same color is again required as the next weft thread, then during the travel of the shuttle 14 associated with the compartment 25 from the left towards the right the blade 59 moves upwardly and raises the hook 55 which was displaced by the cam 50 into the path of movement of the blade 59. Consequently, the lever 61 moves anticlockwise about the pivot 65 and brings about, by means which are not shown, an automatic bobbin change of the color yarn sort which is associated with box compartment 25.

If, in contradistinction to the case just mentioned, immediately after the yarn feeler 49 has ascertained that a bobbin change is necessary, another weft yarn color is required to be picked, then directly after the arrival of the shuttle 14 in the shuttle box 17, the box will be displaced upwardly or downwardly. If the box 17 is moved downwardly, for example by the amount of the height of one compartment, then the compartment 24 passes into its working position, i.e. into the position flush with the sley 11. By this means, the carrier 27 is lowered, and the chain 31 also moves downwardly. Consequently, a certain portion of the rope 36 is wound on the pulley 33 and the preselector 41 pre-tensioned by the spiral spring 42 is rotated clockwise by the rope 36 and against its pretension to such an extent that the pin 45 passes into its operative position before the magnet 48. In this way, the cam 50 is put into a position in which it is no longer able to actuate the hook 55 associated with it. Only when the shuttle of compartment 25 is again in operation and the compartment 25 is again in its working position, i.e. flush with the sley 11, will the bobbin change take place; the necessity for which has meanwhile been stored in the preselector by the projecting cam 50.

According to the invention, there are provided on both sides of the pins 44 to 47, second elements 65, 66 and 67, 68 which are shaped as small rods. These rods are so rotatable about a pivot that when one end of the rod is moved rearwardly the other end thereof is moved forwardly. If, for example, the small rod 65 is positioned before the magnet 48 and the weft yarn monitoring means 49 indicates that there is an empty bobbin in the shuttle 14, then the actuation of the magnet 48 by means 49 causes a pressure to be exerted on the end of the small rod 65 facing the pivot 43. By this means, the other outer end of the rod 65 is pressed against the holding device 70. There the rod impinges on an actuating member which is formed by a pin 71 and which, due to the pressure exerted, moves a pin 72 downwardly. The consequence of this is that the two-armed lever 73 rotates anti-clockwise

about the pivot 74 and releases the member 75 which is pivotal about the pivot 75. Member 76, due to the action of the tension spring 77, then rotates anticlockwise about its pivot 75. By means of the rod 78 secured on the member 76 and due to the movement of the said rod via means (not shown) the weaving loom is immediately uncoupled from this driving drive unit and braked.

Thus, to sum up, it must be stated that actuation of the magnet 48, depending on the position of the pre-selector 41, via the first elements 44 to 47, initiates an automatic bobbin change or, via the second elements 65 to 68, brings the loom to a standstill.

To the extent that the control arrangement illustrated relates to the operation of the first elements 44 to 47, it is a known device for automatic bobbin changing. Due to the provision of the second elements 65 to 68 on the pre-selector 41, this control device is additionally given (in the simplest possible manner) the property that it permits, when supplementary shuttles are used, a form of manual bobbin changing having the advantages heretofore described.

It will be clear that the arrangement illustrated will permit the following variations in the association of the shuttle box compartments 21 to 26 with the operative elements 44 to 47 and 65 to 68:

Variant	Shuttle Compartments	Associated Control Elements
I.....	21, 22 23 to 26	68, 67 47 to 44
II.....	21 22 to 25	67 47 to 44
III.....	26 21 to 24 25, 26	66 47 to 44 66, 65

It will be quite readily apparent that a change-over from one of the variants i.e., I, II or III to another of the variants can be achieved very simply by lengthening or shortening either the chain 31 or the rope 36 by an amount such that the entire upward and downward movement of the shuttle box displaces the desired element of the control elements 44 to 47 or 65 to 68 into the operative position. To this end, the fastening means 35 for the end of the rope 36 on the pre-selector 41 may be made detachable so that, by releasing the fastening means 35, the effective length of the rope 36 is adjustable or selectable.

When setting up the program cards, therefore, the present invention permits variations in the selection of the shuttle box compartments 21 to 26 for the colors which are seldom used. Referring to the example heretofore mentioned relating to the use of main colors brown, yellow, brown and red and the subsidiary colors green and black, the variant I would be selected in the case wherein the subsidiary colors are located between the two "brown" strips. That is, the subsidiary colors would be arranged in the compartments 21 and 22 and the main colors in the compartments 23 to 26, with the "brown" shuttle in compartment 23, in order to achieve minimum shuttle box movements. In the other case, wherein a black strip is arranged between the two brown strips and a green strip between the two red strips, variant II would be selected. In this connection, for example a "green" shuttle would be arranged in compartment 21, the shuttles carrying the main colors would be arranged in compartments 22 to 25, with the "red" shuttle in compartment 22 and "brown" shuttle in compartment 25. The "black" shuttle would be arranged in compartment 26. Also in this case, only minimum movements of the shuttle box take place.

If consideration is given to the large number of different designs of cloths which exist, then it will be clear that, due to the enlarged number of possibilities for variation of the color associations according to the present invention, the programming operator has a possibility of reducing the

magnitude of the box movements so that the working life of the device producing the shuttle movement is increased.

While the novel aspects of the invention have been exemplified and described and are pointed out in the appended claims, it is to be understood that various modifications and alterations in the apparatus may be made by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In a bobbin changing arrangement on a weaving loom having an adjustable shuttle box with a plurality of box compartments for shuttles carrying different yarns and a control device having a plurality of first elements for the automatic control of the bobbin-changing operation of a group of compartments in accordance with data supplied by a yarn monitoring means indicating the necessity for a bobbin change, each compartment of the group being associated with one of said first elements in such manner that in operation only compartments and elements associated with each other are simultaneously in their working positions, the improvement which comprises additional second elements positioned on both sides of said first elements for effecting shut down of the weaving loom, the number of the said second elements on each side being equal to the difference obtained from the total number of box compartments in the shuttle box minus the number of box compartments corresponding to those in the group having an automatic bobbin changing operation, and the association of the box compartments with said elements being capable of being varied to permit variation in the selection of the box compartments which are in the group having an automatic bobbin-changing operation.

2. The arrangement of claim 1 in which said control device includes an actuating device for effecting operation of the said elements at the working position for said elements, said elements being adapted to be displaced from said device by means coupled to the shuttle box and said actuating device being controlled by said yarn monitoring means to actuate an element which is in its working position when a bobbin change is needed.

3. The arrangement of claim 2 in which said control device further includes a member on which said elements are arranged along a circular path, said member being rotatable about a pivotal axis, the center of said path being located on said axis, and said shuttle box is coupled with said member via a coupling means so that a separate angular position of the member corresponds to each working position of the shuttle box.

4. The arrangement of claim 2 in which each of the additional second elements comprises a rod-shape mem-

ber that is pivotal about an axis and which, when operated by the actuating device pivots about its axis and thereby displaces an actuating member disposed in its pivoting path; said actuating member effecting the shut down of the loom.

5. The arrangement of claim 2 in which said actuating device comprises an electro-magnet for operating said elements to effect initiation of the automatic bobbin change or shutting down of the loom.

6. The arrangement of claim 1 in which each shuttle compartment which is not associated with a first element is associated with one of the additional second elements.

7. The arrangement of claim 2 in which the shuttle box is coupled selectively with said elements in one of three variations; all of the additional second elements arranged on one side of the first elements being adapted to move adjacent to the actuating device, the number of the additional second elements arranged on both sides of the first elements which is equal to said difference being adapted to move adjacent to the actuating device or the additional elements arranged on the other side of the first elements being adapted to move adjacent to the actuating device.

8. The arrangement of claim 3 in which the rotatable member is pretensioned by a resilient means in one of its directions of rotation and is connected by a coupling means to the shuttle box; said coupling means taking up the pretension supplied by the resilient means whereby movement of the shuttle box is transferred by said coupling means to the rotatable member to effect rotary movement thereof.

9. The arrangement of claim 8 in which the coupling means comprises a rope connecting the shuttle box with the rotatable member; the length of the said rope being variable for the purpose of varying the coupling connection between the shuttle box and said rotatable member.

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