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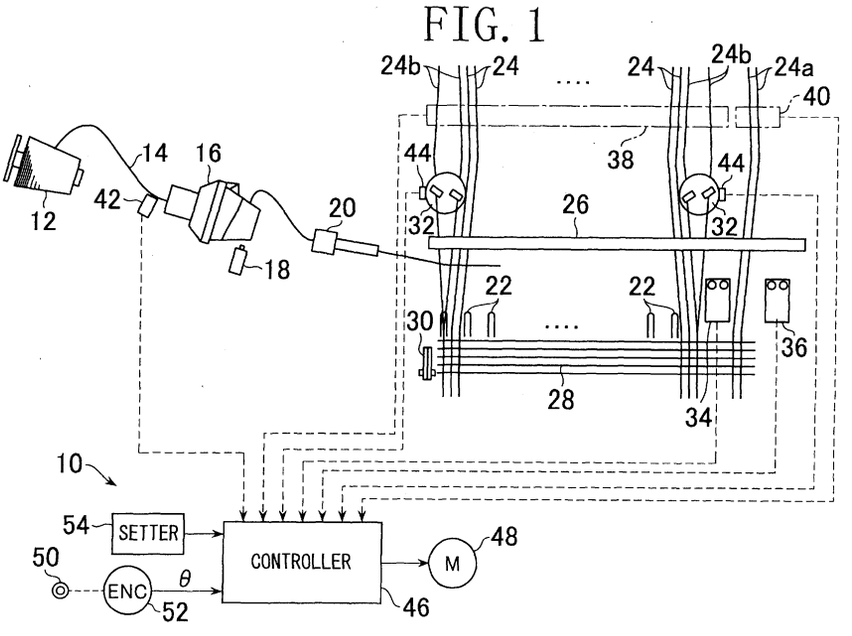
(54) Apparatus for preventing accidental operation of loom

(57) An apparatus for preventing accidental operation of a loom is characterized by storing at least one of first information and second information, the first information representing that, after the loom is stopped by a detection signal from an abnormality detection sensor (34, 36, 38, 40), an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to remove the weft inserted immediately before insertion is not performed, and the second information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of the loom is not performed, and by stopping start running of the loom in case the first or second information is stored in the memory at the time of input of an operation command signal.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an apparatus for preventing accidentally resuming operation of a loom after the loom is stopped due to abnormality in the loom such as weft stop, warp stop and the like.

Description of Prior Art

[0002] When a loom stops due to weft stop because of failure in weft insertion or defective weft and warp stop due to defective warp such as warp end breaking, an operator carries out a restoration work against the cause of stopping such as removing the defective yarn or restoration of the broken yarn, and then resumes the operation.

[0003] In view of the above, an operation button (operation command button) for operating a loom during stoppage of the loom is generally made operable. Therefore, in a conventional loom, even if an operator has not restored, operation of the loom is resumed in that state if the operation button is operated. In such a case, the quality of a cloth is degraded.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to prevent degradation in quality of a cloth due to resuming of operation when an operator has not restored the cause of stoppage.

[0005] A first apparatus for preventing accidental operation according to the present invention comprises an abnormality detection sensor for detecting abnormality in weft insertion, weft or warp, and a controller for stopping the loom by an abnormality detection signal from the sensor as well as starting running of the loom by an operation command signal from the operation command switch. The controller includes: memory for storing at least one of two pieces of information, which include first information representing that, after the loom is stopped by the abnormality detection signal, an operation to have a drive shaft of a shedding device normally rotate or reverse up to a rotational angle at which the weft inserted immediately before stopping of the loom is removed is not performed, and second information representing that an operation to have the drive shaft normally rotate or reverse up to the rotational angle for the loom to start running is not performed; and an operation preventing circuit for preventing the loom from starting running in case the first or second information is stored in the memory at the time of input of the operation command signal.

[0006] According to the foregoing first apparatus for preventing accidental operation, after the loom is stopped due to the detection signal of abnormality in the weft insertion, weft or warp, the loom is prevented from resuming its operation until the normal or reverse rotation of the drive shaft of the shedding device is performed up to the rotational angle at which the weft inserted immediately before stopping of the loom is removed, or until the normal or reverse rotation of the drive shaft is performed up to the rotational angle at which the loom is started to run, thereby preventing degradation in quality of the cloth due to the accidental operation after the stoppage because of the abnormality in weft insertion, weft or warp.

[0007] The loom is a pile weaving machine, and the operation preventing circuit may be adapted to prevent the operation of the loom in case the first or the second information is stored in the memory at the time the operation command signal is inputted, whether or not the time the abnormality detection signal is generated was either at a fast picking or a loose picking.

[0008] A second apparatus for preventing accidental operation according to the present invention comprises an abnormality detection sensor for detecting abnormality in the weft insertion, weft or warp, and a controller for stopping the loom by the abnormality detection signal from the sensor as well as for starting running of the loom by the operation command signal from the operation command switch. The controller includes: memory for storing at least one of tow pieces of information, which include the first information representing that, after the loom is stopped by the abnormality detection signal, an operation to have the drive shaft of the shedding device normally rotate or reverse up to a rotational angle at which a second weft one pick before a first weft inserted immediately before the stopping is removed is not performed, and the second information representing that an operation to have the drive shaft normally rotate or reverse up to the rotational angle at which the loom is started running is not performed; and an operation preventing circuit for preventing the loom from starting running in case the first or second information is stored in the memory at the time of input of the operation command signal.

[0009] According to the second apparatus for preventing accidental operation, the loom is prevented from resuming its operation until an operation to have the drive shaft of the shedding device normally rotate or reverse up to the rotational angle at which, after the loom is stopped by the abnormality detection signal in the weft insertion, weft or warp, the second weft one pick before the first weft inserted immediately before stopping is removed, or until an operation to have the drive shaft normally rotate or reverse up to the rotational angle at which the loom is started to run is performed, thereby preventing degradation in quality of the cloth due to accidental operation after stopping because of abnormality in the weft insertion, weft or warp. Also, as for a loom to remove two picks wefts for preventing a weft bar before the loom resumes operating, the weft removal is surely

performed, so that no weft bar because of the accidental operation is generated.

[0010] A third apparatus for preventing accidental operation according to the present invention comprises an abnormality detection sensor for detecting abnormality in a selvedge yarn or a catch cord, and a controller for stopping the loom by an abnormality detection signal from the sensor as well as for starting running of the loom by an operation command signal from an operation command switch. The controller includes: memory for storing at least one of two pieces of information, which include first information representing that, after the loom is stopped by the abnormality detection signal, an operation to have the drive shaft of the shedding device normally rotate or reverse up to the rotational angle at which a broken yarn is restored by a selvedge device or a yarn end disposing device respectively using the selvedge yarn or the catch cord is not preformed, and second information representing that an operation to have the drive shaft inch or reverse up to the rotational angle at which the loom is started operation is not performed; and an operation preventing circuit for preventing the loom from starting running in case either the first or second information is stored in the memory at the time of input of the operation command signal.

[0011] According to the foregoing third apparatus for preventing accidental operation, after the loom is stopped by the abnormality detection signal of the selvedge yarn or the catch cord until an operation to have the drive shaft of the shedding device normally rotate or reverse up to the rotational angle at which restoration work is done to the selvedge yarn or catch cord or until an operation to have the drive shaft normally rotate or reverse up to the rotational angle to start running of the loom, the loom is prevented from resuming operation, thereby preventing degradation in quality of the cloth due to accidental operation after the stop because of the abnormality in the selvedge yarn or catch cord.

[0012] In any of the apparatus for preventing accidental operation mentioned above, the controllers can include detection means for generating the detection signal for eliminating the first or second information in the memory by detecting that the command signal for performing the normal rotation or reverse rotation was inputted or that the drive shaft was rotated.

[0013] A fourth apparatus for preventing accidental operation according to the present invention comprises an abnormality detecting sensor for detecting abnormality of the weft supplied for weft insertion, and a controller for stopping the loom by the abnormality detection signal from the memory as well as for starting running of the loom by the operation command signal from the operation command switch signal. The controller includes: memory for storing the first information representing that, after the loom is stopped by the abnormality detection signal, the operation for setting the weft in a weft length measuring storage unit or in the weft insertion device is not performed; and an operation preventing circuit for preventing the loom from starting running in case the first information is stored in the memory at the time the operation command signal is inputted.

[0014] According to the fourth apparatus for preventing accidental operation, after the loom stopped by a detection signal representing abnormality in the weft supplied for weft insertion, the loom is prevented from resuming operation until the operation to set the weft in the weft length measuring storage unit or the weft insertion device is performed, thereby preventing degradation in quality of the cloth due to the accidental operation after stopping by the abnormality in the supplied weft.

[0015] A fifth apparatus for preventing accidental operation according to the present invention comprises: a first abnormality detection sensor for detecting abnormality in the weft insertion, weft or warp; a second abnormality detection sensor for detecting abnormality in the selvedge yarn or catch cord; a third abnormality detection sensor for detecting abnormality in the weft supplied for weft insertion; and a controller for stopping the loom by an abnormality detection signal from the first, second or third abnormality detection sensor as well as for starting running of the loom by an operation command signal from the operation command switch.

The controller includes: memory for storing at least one of seven pieces of information, and an operation preventing circuit for preventing the loom from starting running in case, at the time of input of the operation command signal, the first or second information is stored or the third or fourth information is stored, and in case the fifth or sixth information is stored or the seventh information is stored.

The first information represents that, after the loom is stopped by the abnormality detection signal from the first abnormality detection sensor, an operation to have the drive shaft of the shedding device normally rotate or reverse up to the rotational angle at which the weft inserted immediately before stopping is removed is not performed;

the second information represents that an operation to have the drive shaft normally rotate or reverse up to the rotational angle at which the loom is started running is not performed;

the third information represents that an operation to have the drive shaft normally rotate or reverse up to a rotational angle at which a second weft one pick before a first weft inserted immediately before stopping is removed is not performed;

the fourth information represents that an operation to have the drive shaft normally rotate or reverse up to the rotational angle at which the loom is started running is not performed;

the fifth information represents that, after the stop of the loom due to an abnormality detection signal from the second abnormality detection sensor, an operation to have the drive shaft of the shedding device normally rotate or reverse up to the rotational angle at which the broken yarn is restored by the selvedge device or the

yarn end disposing device respectively using the selvedge yarn the catch cord is not performed;

the sixth information represents that an operation to have the drive shaft normally rotate or reverse up to the rotational angle at which the loom is started running is not performed; and

the seventh information represents that, after the stop of the loom due to an abnormality detection signal from the third abnormality detection sensor, an operation to set the weft in the weft length measuring device or the weft insert device is not performed.

[0016] According to the fifth apparatus for preventing accidental operation, too, degradation in quality of the cloth caused by accidental operation after stopping due to abnormality in weft insertion, weft or warp, or selvedge yarn, catch cord or supplied weft can be prevented.

[0017] The sixth apparatus for preventing accidental operation according to the present invention comprises the controller for stopping the loom by the abnormality detection sensor for detecting abnormality in the weft or the warp and the abnormality detection signal as well as for operating the loom by the operation command signal from the operation command switch. The controller includes an operation preventing circuit for preventing the loom from starting operation in case the abnormality detection signal is inputted.

[0018] According to the sixth apparatus for preventing accidental operation, when the abnormality detection signal of the weft or the warp is inputted at the time of input of the operation command signal, thereby preventing degradation in quality of the cloth due to accidental operation after stopping because of an abnormality of the weft or the warp.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a diagram showing an embodiment of the loom provided with the apparatus for preventing accidental operation according to the present invention.

Fig. 2 is an electric circuit diagram showing an embodiment of the apparatus for preventing accidental operation according to the present invention.

Fig. 3 is a view showing a flowchart for explaining actions of the apparatus shown in Fig. 2.

Fig. 4 is a view showing a flowchart for explaining actions following Fig. 3.

Fig. 5 is a view showing a flowchart for explaining actions following Fig. 4.

Figs. 6 (A), (B), (C) and (D) are diagrams showing a state of the loom for explaining the first embodiment of the technique to prevent accidental operation according to the present invention.

Fig. 7 is a diagram showing a state of the loom for explaining the second embodiment of the technique to prevent accidental operation according to the present invention.

Figs. 8 (A), (B) and (C) are diagrams showing a state of the loom for explaining the third embodiment of the technique to prevent accidental operation according to the present invention.

Fig. 9 is a diagram showing a state of the loom for explaining the fourth embodiment of the technique to prevent accidental operation according to the present invention.

Fig. 10 is an electric circuit diagram showing the fifth embodiment of the technique to prevent accidental operation according to the present invention.

Fig. 11 is a view showing a flow chart.

Fig. 12 is an electric circuit diagram showing an embodiment of the apparatus for preventing accidental operation to carry out the sixth embodiment.

PREFERRED EMBODIMENTS OF THE INVENTION

[0020] Referring to Fig. 1, the apparatus 10 for preventing accidental operation is used in an air jet loom using, for example, the compressed air as a fluid for weft insertion.

[0021] In the air jet loom, the weft 14 wound on a weft package 12 is measured to a predetermined length by a length measuring storage unit 16, and acts as supplied weft engaged by an engagement pin device 18 and stored, with its front end portion led into a main nozzle 20.

[0022] The weft led into the main nozzle 20 is released by the engagement pin device 18 for a predetermined period of time, jetted together with the compressed air from the main nozzle 20 and inserted into a shedding of the warp 24.

[0023] The inserted weft 14 is beaten against the cloth fell of a fabric 28 by a reed 26, cut off by a cutter 30 to be cut away from a weft portion led into the length measuring storage unit 16 via the main nozzle 20.

[0024] Of the warp 24, a plurality of warp portions 24a located at the end portion on the non-insert side in the direction of the textile width are used as catch cords, while a plurality of selvedge yarns 24b located inside the catch cords 24a as well as a plurality of selvedge yarns 24b located at the end portion on the insertion side are used as selvedge yarns to be formed into a leno tassel selvedge by a selvedge device 32. These catch cords, warp portions and another warps are performed shedding motion by a shedding device driven and connected with a main shaft 50 or other shedding device using a motor driven in synchronism with the rotation of the main shaft 50.

[0025] The air jet loom further comprises a pair of weft feelers 34, 36 disposed on the non-insert side at an interval in the weft inserting direction, a known dropper device 38 for detecting cutting or looseness of the warps 24; a catch cord sensor 40 for detecting cutting or looseness of the catch cord 24a; a supplied weft sensor 42

for detecting cutting of the weft (supplied weft) 14 drawn out of the weft package 12; and a selvedge yarn sensor 44 disposed in each selvedge device 32 and detecting the cutting or using up of the selvedge yarn 24b.

[0026] The weft feeler 34 is a known H1 feeler for detecting the front end portion of a correctly inserted weft, and the weft feeler 36 is a known H2 feeler for detecting that the inserted weft becomes a long pick, a middle cutting or the like, when such a case occurs. The catch cord sensor 40 actuates similarly to the dropper device 38 and detects cutting or looseness of the catch cord 24a.

[0027] As the selvedge device 32 and the selvedge yarn sensor 44, those described in Japanese Utility Model Appln. Public Disclosure (KOKAI) No. 62-30364 can be used. Such selvedge device 32 forms a pair of selvedge introduction holes on a turntable to be rotated in synchronism with the rotation of the main shaft 50 and forms a leno texture by the rotation of the turntable. Such selvedge device 32 may be led into the main shaft 50 and driven, connected with the main shaft 50, or may be driven by a motor which is driven in synchronism with the main shaft 50.

[0028] Though not explained in detail, the selvedge yarn sensor 44 can include a crank energized by a spring so as to resist the tension of the selvedge yarn, and a sensor member for outputting an abnormality signal when the selvedge yarn is abnormal, detecting that the selvedge yarn has arrived at a position corresponding to the yarn abnormality by the elastic force of the spring.

[0029] As the selvedge device 32 and the selvedge yarn sensor 44, such a device as mentioned above, a device other than a sensor, and a sensor may be used.

[0030] Each of the weft feelers 34, 36 and the selvedge yarn sensor 44 acts as a weft sensor, and each of the dropper device 38, the catch cord sensor 40 and the supplied weft sensor 42 acts as a warp sensor. The detection signals of these sensors are supplied to the controller 46 of the apparatus 10 for preventing accidental operation as abnormal detection signals.

[0031] The controller 46 serves as a main controller for controlling a prime motor (main shaft motor) 48 of the loom as well as various devices of the loom. The controller 46, therefore, receives not only the above-mentioned detection signal but also a rotational angle signal θ from an encoder 52 for detecting the rotational angle of the main shaft 50 and receives various set values as set in a setter 54 to control the rotation of the prime motor 48 on the basis of the data such as the received signal and set values.

[0032] Referring to Fig. 2, the controller 46 is provided with an input port 60, an output port 62, a central processing unit (CPU) 64 and a memory 66 for storing various pieces of information.

[0033] In the setter 54, information such as various control data for the loom and timings to cancel prevention of operation. The controller 46 receives detection signals from the sensors 34, 36, 38, 40, 42 and 44 as well as the rotational angle signal θ from the encoder 52 at the input port and reads in various pieces of information set in the setter 54.

[0034] The controller 46 further receives at the input port 60 an operation command from an operation command button 68 for starting operation (running) of the loom, an inching command (normally rotate command) from an inching command button 70 for inching the loom, a reverse command from a reverse command button 72 for reversing the loom, a stop command from a stop command button 74 for stopping the loom, a release command from a release command button 76 for releasing the weft from the length measuring storage unit, and a pre-winding command from a pre-winding command button 78 for winding on the length measuring storage unit 16 at the time the loom stops to store the weft necessary for one weft insertion plus an extra amount.

[0035] The controller 46 supplies a predetermined control signal through an output port 62, based on various signals, data and commands received, to the selvedge device 32, a switch 80 for opening and closing a path for electricity to the prime motor 48, a switch 84 for opening and closing a path for electricity to an electromagnetic brake 82 which applies braking force to the prime motor 48 and the main shaft 50, a current controller 88 which controls the current supplied to a drive motor 86 for the yarn guide of the length measuring storage unit 16, a drive circuit 92 for controlling the electricity to an engagement pin solenoid 90 of the length measuring storage unit 16, a weft insertion device 94 and a warp shedding device 96, respectively.

[0036] The controller 46 also controls an indicating lamp 98 which indicates a stoppage of the operation. This informs an operator of the stoppage of the operation. It is, however, possible to inform the operator of the stoppage by letters, a warning sound or voice.

[0037] Preventing of the operation is done by software according to a program stored in the memory 66 similarly to other controls of the loom.

[0038] The following is an explanation of actions of the apparatus 10 for preventing accidental operation, for example, when the weft insertion fails during operation of the loom and an abnormality detection signal is outputted from the weft feelers 34 or 36.

[0039] When weft insertion fails, an abnormality detection signal is outputted from the weft feeler 34 or 36, so that the controller 46 stops the loom, to begin with.

[0040] Next, the controller 46 automatically reverses the loom to a rotational angle at which the mis-inserted weft can be removed and to a rotational angle to make the loom stand by, and making the operation command button 68 ineffective, and puts the loom to stoppage.

[0041] The controller 46 informs the operator through an indication lamp or the like (not shown) that the loom is in the stoppage (a standby state), indicates by lighting the indicating lamp 98 the state that the operation is prevented, and even if an operation command is inputted

by pushing the operation command button 68, makes the operation command ineffective.

[0042] On arrival, the operator operates (i. e., push) a reverse command button 72 to remove the weft inserted immediately before the loom stopped (i.e., mis-inserted weft) and reverses the loom. Thus, the mis-inserted weft is exposed at the cloth fell and becomes removable, thereby completing the preparation for removal of the weft.

[0043] Then, when the operator, removing the mis-inserted weft from the open cloth fell, operates the reverse command button 72, the controller 46 reverses the loom (i. e., the main shaft 50) to the rotational angle for resuming the operation of the loom automatically or by an input of the reverse command. This completes the preparation for resuming the operation. Thereafter, the controller 46 makes the operation command button 68 effective and resumes the operation of the loom by an input of the operation command.

[0044] The timing for making the operation command button 68 ineffective and bringing into the prevented state of operation can be made an arbitrary time from the occurrence of a cause for stoppage until the loom is stopped at the rotational angle to get into standby.

[0045] On the other hand, the timing for canceling the prevented state of operation and making the operation command button 68 (i.e., the operation command) effective may be either at the rotational angle to resume operation of the loom or at an arbitrary time when or after the reversing operation of the weft inserted immediately before the stop up to the rotational angle at which the weft can be removed. Further, the removal of the mis-inserted weft can be done either by the operator or automatically.

[0046] In the following are explained in detail actions of the apparatus 10 for preventing accidental operation.

[0047] If a cause for stopping arises during the normal operation of the loom (step 100), the controller 46 carries out a step for preventing the operation to stop the loom (step 101). In this step 101, firstly, energizing of the prime motor 48 is stopped, and the loom is stopped by applying the braking force by an electromagnetic plate 82 to the main shaft 50 (first stop), and next, by reversing the main shaft 50 automatically or manually to the rotational angle at which the weft inserted immediately before can be removed, the loom is stopped at the rotational angle of the main shaft 50to make the loom stand by (second stop).

[0048] Then, the controller 46 puts the loom into stoppage (standby state) after the second stop and turns an operation preventing flag on. This makes the operation command button 78 ineffective, lights the indicating lamp 98, and puts the loom into the operation-prevented-state. The operation preventing flag is the information representing that an operation for restoring or resuming operation is not performed, and the state of setting this flag is set in the internal memory of the CPU 64 or the memory 66.

[0049] In the above-mentioned operation-prevented-state, the controller 46 waits for pushing of a suitable command button.

[0050] Referring to Fig. 4, when the suitable command button is pushed (step 103), the controller 46 judges whether the pushed command button is the operation command button 68 or not (step 104).

[0051] If the pushed command button is the operation command button 68, the controller 46, being prevented from operating, waits for pushing of another command button.

[0052] When another command button is pushed, the controller 46 has the loom perform an action corresponding to the command button pushed for restoration of the cause for stopping (step 105). Concretely, in case of a failure in weft insertion, step 105 reverses the prime motor 48 and the main shaft 50 up to the rotational angle of 180° at which the weft inserted immediately before stopping can be removed to reverse a shedding device 96.

[0053] Next, the controller 46 judges whether the timing (time to cancel operation-prevented-state) to cancel the stoppage of operation was cleared or not (step 106). As regards the time for judgment, it can be preset through the setter 54, for example, making it the time for judgment that the loom (i. e., the main shaft 50) is reversed to a predetermined rotational angle, and more concretely, that the main shaft 50 is reversed to the rotational angle of 300° at which the loom resumes its operation. In this case, the controller 46 monitors the rotational angle signal θ of the main shaft 50 of the loom over a period while the main shaft 50 is reversed and can judge whether the set timing for canceling the prevented state of operation was cleared or not.

[0054] When the normal or reverse rotation is finished, unless the timing for canceling the prevented state of operation is cleared, the controller 46, returning to step 103, waits for pushing of another command button. Concretely, even if the operator stops the loom at 180° by the reverse operation of the above step 105, since the above operation-prevented-state is not cleared, the controller 46, returning to step 103, waits for pushing of the next command button.

[0055] Then, after the operator removed the mis-inserted weft, and when the command button is re-operated (step 103), the main shaft 50, which is the corresponding device, is reversed toward the rotational angle of 300° for the loom to resume its operation (step 105), and the controller 46 judges whether the above-mentioned set timing for canceling the operation-prevented-state is cleared or not and detects that the rotational angle signal θ of the main shaft 50 has reached 300°, then the controller 46 turns the operation preventing flag OFF and, thereafter, cancels the operation-prevented-state to make the operation command effective by operating the operation command button 68 (step 107).

[0056] Referring to Fig. 5, when the operation command button 68 is pushed (step 108), the controller 46

resumes the operation of the loom since the operation-prevented-state has already been cancelled (step 109). Thereafter, the controller 46 controls the loom as usual.

[0057] In the loom which resumes operation after removing the weft in response to abnormality in the weft such as above, the timing for canceling the operation-prevented-state is set through the setter 54. Such timing for canceling the operation-prevented-state can be, for example, the timing that the preparation for resuming the operation of the loom is completed, that is, at an arbitrary time when or after the start of the reversal after the weft is removed. More concretely, reaching the rotational angle of 300° at which the loom resumes its operation by the reversal operation can be set as timing for canceling the operation-prevented-state that.

[0058] Therefore, with respect to the above-mentioned flowcharts shown in Figs. 3 through 5, in step 106 for judging whether the timing for canceling the operation-prevented-state was cleared or not, the judgment as to whether the timing for canceling the operation-prevented-state as set in the above was satisfied or not is made every time the push button is operated.

[0059] Namely, after the weft was removed, until the reverse operation to the rotational angle of 300° for resuming the operation of the loom, the operation command is made ineffective and then by the judgment in step 106, switching to the second disposal step is done to make the operation command effective. This enables to surely prevent any accidental operation of the loom, thereby surely preventing such inconvenience as "degrading the quality of a cloth due to the accidental operation" which has so far been a problem.

[0060] As the timing for canceling the operation-prevented-state, it is possible to use, besides the above-mentioned time, the time when the preparation for the weft removal is completed, that is, an arbitrary time when and after the reverse operation to remove the weft is started, and more concretely, the rotational angle of 180° when the second weft can be removed by the reverse operation to remove the weft. Even in case such timing for canceling the operation-prevented-state was set, since a judgment corresponding to such a set timing is made, an accidental operation and a trouble caused thereby can be prevented likewise.

[0061] When the operation of the loom is enabled at the rotational angle of 180° at which the weft can be removed as mentioned above, there will arise more risk for accidental operation than when the time for preparation for resuming operation to complete is made timing for canceling the operation-prevented-state. However, as a matter of fact, the operator can sufficiently recognize that the weft should be removed according to the prevented state of operation, so that there is a little possibility for the operator to operate without removing the weft, and forgetting the operation to reverse to the rotation angle of 300° at which the loom resumes its operation. Consequently, it does not matter so much, if the operation-prevented-state is cancelled at the rotation angle of 180° at which the weft can be removed.

[0062] In Fig. 6 is shown an example of the motion of the loom from failing in the weft insertion to the resumption of the operation where the angle for resuming the operation of the loom is 300°. In this case, the failure in the weft insertion may be one caused by the detection signal of either the weft feeler 34 or 36.

[0063] Fig. 6 shows an embodiment of the motion of the loom when restoration process for restoring the cause for stoppage (abnormal weft insertion) is carried out when the loom is stopped by the detection signal of either the weft feeler 34 or 36.

[0064] Fig. 6 also shows a case that a failure in the insertion of the weft 14a indicated by a circle including cross (x) mark inside in Fig. 6(B) causes the loom to stop at a time T1, and that the electromagnetic brake 82 is actuated at the rotation angle of 300° in an insertion cycle of the weft 14a, thereby stopping the loom at 250° in an insertion cycle of the subsequent weft 14b.

[0065] As shown in Fig. 6(C), when a defective weft insertion occurs, the controller 46 actuates an electromagnetic brake 82 from around 300°. Thus, the loom makes inertial rotation of the main shaft 50 to around 250° in the subsequent weft insertion cycle and stops (the first stop).

[0066] Next, the controller 46 makes the loom automatically reverses at a low speed up to 300°. The loom, reaching 300° by the reverse rotation of the main shaft 50, stops the reverse rotation of the main shaft 50 (the second stop), makes display means (not shown) indicate that "the weft stop occurred" and stands by to wait the arrival of an operator. The rotational angle of 300° of the main shaft 50 is an angle for the warp 24 to get into a closed state, in order to prevent generation of a weft bar by elongation of the warp 24 during the standby state.

[0067] The operator, on arrival, pushes a reversal command button 72 immediately so as to restore (remove) the mis-inserted yarn 14a which has caused the loom to stop. By this, the controller 46 reverses the main shaft 50 up to 180° in response to the reversal command. The rotational angle 180° of the main shaft 50 is an angle for the warp 24 to get into an open state, and the mis-inserted yarn 14a is exposed at the cloth fell; in other words, at this time, the preparation for removing the weft is completed. Therefore, the operator can remove the mis-inserted yarn 14a which is in the exposed state.

[0068] Whether the preparation for removing the weft is completed or not can be recognized by whether the loom is reversed at a low speed up to 180° after the first stop. Preferably, to the judgment as to whether the preparation for removing the weft is completed or not, the judgment as to whether or not there are output signals of various sensors such as a guard sensor disposed in the cloth fell for assuring safety of the operator, a sensor for detecting opening and closing of a cover door provided ahead for prevention of a stream for weft insertion

from scattering such as a water jet loom, etc., may be added.

[0069] Then, when the reversal command button 72 is pushed again by the operator and the command to reverse is re-inputted to the controller 46, the controller 46 further reverses the loom at a low speed. At this point in time, the preparation for resuming the operation is completed, so that the operation-prevented-state is canceled, and the indicating lamp 98 is put out.

[0070] In the embodiment shown in Fig. 6, it is possible to constitute to enable the controller 46 to cancel the stoppage when the reversal command button 72 was pushed a predetermined number of times. However, it is preferable that whether the mis-inserted weft 14a was removed and the canceling timing of the operation-prevented-state was effected or not be recognized by the AND timing between pushing of the reversal command button 72 and the reversal of the loom up to 300°.

[0071] When the operation command button 68 is pushed and the operation command is inputted, the controller 46 makes the loom resume the operation.

[0072] Reversing and resuming the operation of the loom in preparing for resumption of the operation can be performed, not by pushing the reversal command button 72 and the operation command button 68 and based on the inputs of the reversal command and the operation command, but automatically without interruption on the basis of the input of a corresponding command by pushing a command switch (not shown). In this case, the operation-prevented-state is automatically cancelled when the command button is operated or the main shaft 50 was reversed up to 300°.

[0073] Fig. 6 is an example of removing a mis-inserted weft 14a in case of failure in weft-insertion, but the mis-inserted weft 14a and the weft 14 inserted before the mis-inserted weft may be removed. Also, in case of a failure, other than a failure in the weft insertion, such as a warp stop and a failure in the supplied weft, one or more wefts can be removed regardless of the cause of the stoppage.

[0074] Also, in the embodiment shown in Fig. 6, the main shaft 50 (i. e., the loom) is reversed both when preparing for removing the weft and when preparing for resuming operation, but the operation-prevented-state may be cancelled by pushing a command button for inserting one weft after the preparation for removal of the mis-inserted weft was completed, and after the main shaft 50 is rotated at a low speed from 180° up to 300°. In this case, a new weft is inserted in place of the mis-inserted one and woven into a cloth.

[0075] The embodiment shown in Fig. 6 is an example of a plain weave, but can be applied to a pile weaving. A pile fabric can be formed generally by incorporating textures of the pile weaving and the ground fabric by a predetermined length. Also, for example, in a towel weave with three-picks wefts, a pile is formed with two loose picks and one fast pick.

[0076] In case of such a pile weave as mentioned above, even if a weft stop or a warp stop occurs in whichever of the loose pick and the fast pick, it is possible to have the operator surely perform the removal of the weft, by preventing the operation of the loom until the completion of the preparation for operation to remove the weft by rotating or reversing the main shaft 50 to the rotational angle at which the weft can be removed.

[0077] Fig. 7 shows an embodiment for removing two wefts regardless of the cause of the stoppage and repairing the cause of stoppage. This embodiment raises the effect of prevention of a weft bar in a woven fabric such as glass fabric using glass fibers.

[0078] In Fig. 7, when any cause of stoppage occurs, the controller 46 actuates the electromagnetic brake 82 from 300°. By this, the loom makes inertia rotation of the main shaft 50 up to the neighborhood of 250° in the following weft insertion cycle and stops (the first stop).

[0079] Next, the controller 46 makes the main shaft 50 of the loom automatically reversed to 300° at a low speed. The loom, when the main shaft 50 is reversed to 300° as a result of the above-mentioned reversal, stops the reversal of the main shaft 50 (the third stop), displays the information "the weft was stopped" in the indication means (not shown), to bring into a standby state to wait for the arrival of the operator. The rotational angle 300° of the main shaft 50 is the angle at which the warp shedding is closed so as to prevent a generation of the weft bar.

[0080] On arriving, the operator operates a reverse command button 72 to remove the weft inserted immediately before stopping. This makes the controller 46 reverse the main shaft 50 in response to the reverse command and stop reversing at the rotational angle of 180° (second stop). The rotational angle 180° is, as mentioned above, an angle to bring the warp shedding into an open state. At this rotational angle, the mis-inserted weft 14a is brought into an exposed state at the cloth fell. For this reason, the operator can remove the initial weft which is in the exposed state.

[0081] Next, when the reverse command button 72 is pushed by the operator, the controller 46 further reverses the loom at a low speed to 300° to stop (fourth stop).

[0082] Then, the operator pushes down the reverse command button 72 to remove the weft further ahead. This causes the controller 46 to further reverse and the main shaft 50 at a low speed to 180° where the previous weft can be stopped by inputting of the reverse command (fifth stop). At this time, the preparation for removing the weft is completed, and at the position of the rotational angle, the previous weft is removed by the operator.

[0083] The reversal from the position where the first weft can be removed (the rotational angle of the second stop) to the position where the previous weft can be removed (the rotational angle of the fifth stop) may be continuously done.

[0084] Next, when the reverse command button 72 is pushed further by the operator and the reverse com-

mand is inputted to the controller 46, the controller reverses the main shaft 50 at a low speed further to 300° and stops (the sixth stop). At this time, the preparation for resuming operation is completed, so that the operation-prevented-state is cancelled and the indicating lamp 98 is put out.

[0085] In the embodiment shown in Fig. 7, too, it is possible to constitute for the controller 46 to cancel the operation-prevented-state when the reverse command button 72 was pushed a predetermined number of times.

[0086] Then, when the operation command button 68 is pushed and the operation command is inputted, the controller 46 resumes operating the loom.

[0087] As mentioned above, regardless of the cause for stoppage, in the loom which re-operates by removing two weft portions, the timing to cancel the operation-prevented-state set in the controller 46 is set through the setter 54.

[0088] As such timing to cancel the operation-prevented-state, it can be, for example, the time when the preparation for resuming the operation of the loom is completed, that is, an arbitrary time when the reversal started after removing two weft portions or later. More concretely, the timing for canceling the operation-prevented-state can be the time when the rotational angle of 300° for the loom to start its operation by the reverse operation for removing the second weft portion was reached.

[0089] Thus, in step 106 for judging whether the timing to cancel the operation-prevented-state was reached or not in the flowcharts shown in Figs. 3 - 6, whether the set timing to cancel the operation-prevented-state was satisfied or not is judged every time the push button is operated. Ultimately, after the second weft portion was removed until the reverse operation is done to the rotational angle of 300° for resuming operation, the operation command is made ineffective, and thereafter, the judgment in step 106 is changed to the next processing step to make the operation command effective. Therefore, an accidental operation can be surely prevented.

[0090] The timing to cancel the operation-prevented-state may be the time when the preparation for removing the weft portion is completed, that is, an arbitrary time when the operation for removing the second weft portion was started or later, or more concretely, when, by the reverse operation to remove the second weft portion, the main shaft reached the rotational angle of 180° where the second weft portion can be removed. In this case, an accidental operation and inconveniences caused thereby can be prevented by the judgment as to whether or not the rotational angle at which the second weft portion can be removed was reached.

[0091] Thus, as already mentioned, since the loom becomes operable from the rotational angle of 180° at which the second weft portion can be removed, accidental operation is more likely to happen than in case the time of completion of the preparation for resuming operation is made the timing to cancel the operation-prevented-state. However, as a matter of fact, since in view of the heretofore operation-prevented-state the operator can sufficiently recognize at this time that the weft should be removed, a possibility is low for him to operate without removing the weft, or to operate, forgetting to reverse to the rotational angle of 300° for resuming operation. Consequently, it does not matter so much even if the operation-prevented-state is cancelled at the rotational angle of 180° at which the weft can be removed.

[0092] Fig. 8 shows an embodiment of an action of the loom by the controller 46 at the time the controller performs a restoring process to restore the cause of stoppage (abnormal selvage yarn) in stoppage because the selvedge yarn sensor 44 outputted an abnormality detection signal (e.g., a selvedge yarn breakage signal).

[0093] When an abnormality in the selvedge yarn occurs at time T1, the controller 46 firstly actuates the electromagnetic brake 82 from 300°. Thereby, the loom stops after inertial rotation of the main shaft 50 to about 250° in the next weft insertion cycle (first stop).

[0094] Next, the controller 46 automatically reverses the loom at a low speed to 300° to make the loom stand by.

[0095] Then, the controller 46, when the inching command button 70 is pushed and the inching command is inputted, inches the loom to an angle where a restoration process can be done (second stop). Since this enables to complete the preparation for restoration process, the loom can be put into the operation-prevented-state. At the above-mentioned rotational position of the main shaft 50, the restoration process of the abnormality in the selvedge yarn is performed.

[0096] Next, when the reverse command button 72 is pushed to input the reverse command, the controller reverses the loom to 300° at a low speed.

[0097] In the embodiment shown in Fig. 8, the controller 46 cancels the stoppage when the inching command button 70 or the reverse command button 72 is pushed.

[0098] Next, the controller 46 makes the loom resumes its operation when the operation command button 68 is pushed and the operation command is inputted.

[0099] In a loom that performs normal rotation or reverse rotation in restoring an abnormality in a selvedge yarn as mentioned above, the timing to cancel the operation-prevented-state to be set in the controller 46 is set through the setter 54.

[0100] As such timing to cancel the operation-prevented-state, the time when, after the restoration work of the selvedge yarn and the rotation to the rotational angle to resume the operation of the loom, an operation to rotate the loom to the rotational angle for resuming the operation is performed, more concretely, the time when the rotational angle of 300° for the loom to resume its operation is reached by inching operation or reverse

operation may be deemed such timing to cancel the operation-prevented-state.

[0101] Thus, in 106 for judging as to whether or not the timing to cancel the operation-prevented-state in the flowcharts shown in Figs. 3 - 6 was reached, whether or not the timing to cancel the set operation-prevented-state was satisfied is judged every time the push button is operated. Ultimately, the operation command is made ineffective until the rotational angle is reached after the inching or the reversal was performed, and thereafter, the judgment in step 106 is changed to the next process step to make the operation command effective. Therefore, an accidental operation by the judgment in step 106 tat the time of abnormality in the selvedge yarn can be surely prevented.

[0102] As the timing to cancel the operation-prevented-state, either the rotation to a rotational angle where the restoration work for the selvedge yarn can be easily done, more concretely, after the selvedge yarn is broken or used up, inching operation or reverse operation is performed, or any of arbitrary rotational angles between 300° where the loom is in a standby state and a rotational angle positioned at the upper dead center where it is easy to restore a bobbin for the selvedge yarn on the side where the abnormality arose is positioned.

[0103] Thus, judgment is made in correspondence to such timing to cancel the operation-prevented-state, thereby surely preventing an accidental operation such as above. In this case, there is more fear of accidental operation than the time when the preparation for resuming operation is completed is made the timing to cancel the operation-prevented-state.

[0104] However, as a matter of fact, since the operator can fully recognize, in view of the heretofore operation-prevented-state, that the abnormality in the selvedge yarn should be restored, the possibility for the operator to operate without restoring such an abnormality and to operate, forgetting inching or reversing to the rotational angle of 300° to resume operation. Therefore, it does not matter so much even if such a setting as mentioned above was made.

[0105] The embodiment in Fig. 8 can be applied also when the dropper device 38 or the catch cord sensor 40 outputted an abnormality detection signal.

[0106] A shedding device 96 may be of a type to be driven, connected to the main shaft 50, or a type to be driven by a special motor independent from the main shaft 50, such as a pick finder device or an electric shedding device.

[0107] In such a case, it is possible to understand the rotation relative to the main shaft (the normal rotation and the reverse rotation) as the rotation relative to the shaft of the shedding device (the normal rotation and the reverse rotation). Also, in case of a cloth tissue with a small repeating frequency of shedding such as plain weave or twill, it is possible to realize, in place of the reverse rotation, for example, for removing the weft, by rotating the main shaft or the drive shaft of the shedding device normally.

[0108] Further, in case the restoration accompanies the rotation of the main shaft, reaching the rotational angle of the main shaft for performing the restoration is made the timing to cancel the operation-prevented-state, but if it is programmed to automatically rotate to the angle or stop, the operator does not have to confirm the rotational angle but the time the operation was performed can be set as the timing to cancel the operation-prevented-state.

[0109] Fig. 9 shows an embodiment of the action of the loom by the controller 46 at the time the restoration process is performed to restore the cause of stopping (abnormality in the supplied weft) in stoppage because the weft feed sensor 42 outputted an abnormality detection signal (for example, supplied weft breakage signal).

[0110] When an abnormality in the supplied weft occurs at the time T1, the controller 46, receiving the abnormality signal from the sensor 42, actuates the electromagnetic brake 82 firstly from around 300°. Due to this, the loom stops after inertial rotation toward the vicinity of 250° in the subsequent weft insertion cycle (first stop).

[0111] Next, the controller 46 automatically reverses the loom to 300° at a low speed. Since the preparation for restoration process is completed at this rotational position, the restoration of abnormality in the supplied weft is performed.

[0112] Then, the controller 46 resumes operating the main shaft 50 of the loom when the operation command button 68 is pushed and the operation command is inputted.

[0113] In the example shown in Fig. 1, the length measuring storage unit 16 is of a type to rotate the yarn guide and wind the weft of a given length around the drum. In more detail, it is a publicly known weft length measuring storage device provided with a yarn guide to be rotated along the periphery of a immovable drum by a motor independent from a main shaft motor, and an engagement pin to be moved forward and backward relative to the periphery of the immovable drum, driven by an electromagnetic solenoid.

[0114] The weft length measuring storage unit has a push button capable of realizing manually such functions as to move the engagement pin prior to the operation of the loom, to wind the weft around the immovable drum by rotating the yarn guide by a given amount (pre-winding function), and to move the engagement pin backward (releasing function), respectively.

[0115] Consequently, in the restoration process of an abnormality in the supplied weft such settings are performed as to push the release command button 76 to remove the remaining weft on the immovable drum, to push the pre-winding command button 78 to pre-wind the new weft, and to set in a weft insert nozzle on a subsequent stage.

[0116] The operation of the release command button 76 is performed in response to the completion of the

preparation for restoration, and the operation of the pre-winding command button 78 to the completion of the preparation to resume the operation, respectively.

[0117] When restoring the abnormality in the supplied weft as described above, in a loom which accompanies some operation to the length measurement storage unit, the timing to cancel the operation-prevented-state set in the controller 46, similarly to the above, can be set through the setter 54.

[0118] Such timing to cancel operation-prevented-state may be the time when the release command button 76 or the pre-winding command button 78 is operated. Thus, in step 106 to judge whether the timing to cancel the operation-prevented-state was satisfied or not in the flowcharts of Figs. 3 - 6, whether or not the set timing to cancel the operation-prevented-state is judged every time the push button is operated. Ultimately, until the weft is released or the pre-winding is done, the operation command is made ineffective, and thereafter, when the judgment in step 106 is changed to the subsequent process step, the operation command is made effective. Therefore, an accidental operation at the time an abnormality occurred in the supplied weft can be surely prevented.

[0119] In the embodiment shown in Fig. 9, the controller 46 cancels the operation-prevented-state when the release command button 76 or the pre-winding command button 78 was pushed. It is possible, however, to utilize operation for another device such as the weft insertion device for canceling the operation-prevented-state. More concretely, it is possible to utilize an operation signal for differentiating the jet air current from the main nozzle at the normal time from the restoring time, as in case of an air jet loom. Further, in place of the output of the command means, it is possible to utilize the output of a sensor for detecting whether or not the restoration work was done.

[0120] As regards the length measuring storage unit, a device of another type may be used. Also, while the supplied weft sensor 42 is of a type to sense the weft supplied to the length measuring storage unit, it may a sensor of another type. The location for installing the sensor is not restricted to the position in the illustration but may be any place, if it is located on a yarn route.

[0121] In order to cope with a plurality of causes of stopping, it is suggested to prestore a technique to prevent accidental operation such as above including the restoration process as software program for each object to be monitored and have the controller 46 perform the accidental operation preventive technique in accordance with a generated cause of stopping.

[0122] As mentioned above, a process relative to the prevention of operation can be handled by hardware in place of using software. For example, when the restoration accompanies some rotation of the loom, the following steps can be taken.

[0123] With respect to the device shown in Fig. 2 which does not accompany a process by software relative to the prevention of operation, an operation permit circuit shown in Fig. 10 can be disposed between the operation command button 68 and the controller 46.

[0124] In case of an accidental operation preventing device for realizing the technique to prevent accidental operation shown in Fig. 9, it is possible to connect an operation permit circuit 110 to the input of the controller 46, to connect a timing signal generator 112 for generating various timing signals to the input of the operation permit circuit 110, and to connect a timing setter 114 for setting various timings to the timing signal generator 112.

[0125] In the timing setter 114 are set various timings such as the rotational angles of the main shaft respectively for stopping to realize restoration process, preparation for restoration process and preparation for resuming operation.

[0126] The timing setter 112 receives the rotational angle signal θ of the main shaft 50 from the encoder 52 and outputs the timing signal to the operation permit circuit 110 every time the rotational angle of the main shaft 50 reaches the angle set in the timing setter.

[0127] The operation permit circuit 110 includes a discriminating circuit 116 for outputting an operation permit signal S1 when the timing to cancel the operation-prevented-state was satisfied to that effect, and an AND circuit 118 for outputting an AND signal of the operation permit signal S1 and the operation command by the operation command button 68 to the controller 46 as an operation signal S2.

[0128] The discriminating circuit 116 receives detection signals S3 from the sensors 34, 36, 38, 40, 42 and 44, an output signal of the timing signal generator 112, the release command from the release command button 76, the pre-winding command from the pre-winding command button 78, and a loom stop signal S4 (or an automatic reversal completion signal S5) from the controller 46.

[0129] The discriminating circuit 116 outputs the operation permit signal S1 which turns off when the loom stop signal S4 (or the automatic reversal completion signal S5) is inputted and, thereafter, in case the restoration of abnormality in the weft and the like accompanies the rotation of the main shaft 50, turns on when the main shaft 50 of the loom reaches the rotational angle for resuming operation (or when such an operation is performed) and in case the supplied weft is abnormal, turns on when a command signal from the pre-winding command button is inputted.

[0130] The discriminating circuit 116 may be of a type to output to turn on the operation permit signal S1 when the angle to enable restoration of the cause of stopping such as removal of the mis-inserted weft is reached (or when such an operation is performed).

[0131] Consequently, the operation permit circuit 110 cancels the operation-prevented-state when the operation permit signal S1 is generated, and subsequently, the operation signal S2 is outputted to the controller 46

when the operation command is inputted.

[0132] The circuit shown in Fig. 10 can be also applied to the accidental operation preventing techniques shown in Figs. 1 - 8.

[0133] Cancellation of the operation-prevented-state can be also judged by using the output signal of the sensor when pushing down the operation command button. With respect to the devices in Figs. 1 and 2, the software process shown in Fig. 11 can applied. In Fig. 1, the weft sensors 34, 36, 42 and the warp sensors 38, 40, 44 are of the type to output the abnormality detection signals during the detection of abnormality.

[0134] In Fig. 11, when an operator pushes down the operation command button 68 when the restoration process is finished (step 120), the controller 46 judges as to whether the weft sensors 34, 36, 42 and the warp sensors 38, 40, 44 detect abnormality (step 121).

[0135] If it is judged in step 121 that an abnormality signal is outputted from a sensor, which caused stopping, the controller 46 does not operate but returns to step 120 and waits for the operation command button 68 to be pushed. At this time, it is preferable to display by the indicating lamp 98 to inform the operator to that effect.

[0136] However, if the sensor causing the stoppage does not output an abnormality signal, the controller 46 turns the operation preventing flags off to cancel the operation-prevented-state and then moves to the step in Fig. 5 (step 122).

[0137] As mentioned above, the process relative to the prevention of operation can be processed by way of the hardware instead of processing by the software. For example, with respect to the device shown in Fig. 2 which does not accompany the software process relative to the prevention from reversing, the operation permit circuit shown in Fig. 12 can be disposed between the operation command button 68 and the controller 46.

[0138] In case of the apparatus for preventing accidental operation for realizing the technique to prevent accidental operation shown in Fig. 9, an operation permit circuit 130 can be connected to the input of the controller 46.

[0139] The operation permit circuit 130 includes a discriminating circuit 132 to which the abnormality detection signals from the sensors 38, 42, 44 and the operation command from the operation command button 68 are inputted, a delay circuit 134 for delaying the operation command for a given period of time, and an AND circuit 136 which outputs the AND signals of both output signals S1, S6 of the discriminating circuit 132 and the delay circuit 134.

[0140] The discriminating circuit 132 judges as to whether or not any abnormality detection signal is outputted from the sensors 38, 42 and 44 when the operation command from the operation command button is inputted and, if not outputted, cancels the operation-prevented-state and outputs the operation permit signal S1 to the AND circuit 136.

[0141] Accordingly, the discriminating circuit 130 outputs the operation signal S2 to the controller 46 after the delay time by the delay circuit 134 elapsed when the operation command is inputted. In other words, the discriminating circuit 132 makes the operation command ineffective while the abnormality detection signals from the sensors 38, 42 and 44 are being outputted and maintains the operation-prevented-state.

[0142] The operation preventing function may be made by a changeover switch not to work when the necessity arises, such as in case of gaiting or regulating operation of the loom. Further, it is more convenient to provide a reset button for resetting the function to prevent operation so that the operator can reset the function to prevent operation after recognizing a state of the loom to immediately make the loom operable.

[0143] The present invention can be applied not only to a liquid jet loom but also to a shuttleless loom such as a rapier loom as well as to a shuttle loom.

[0144] The present invention is not limited to the above embodiments but can be variously modified without departing its purport.

Claims

1. An apparatus for preventing accidental operation of a loom, comprising: an abnormality detection sensor (34, 36, 38, 40) for detecting abnormality in weft insertion, weft (14) or warp (24); and a controller (46) for stopping the loom by an abnormality detection signal from said sensor (34, 36, 38, 40) and also starting running of the loom by an operation command signal from an operation command switch (68),

   wherein said controller (46) includes: memory (66) for storing at least one of two pieces of information, which include first information representing that, after the loom is stopped by said abnormality detection signal, an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to remove the weft inserted immediately before stopping is not performed, and second information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of the loom is not performed; and an operation preventing circuit for preventing the loom from starting running in case said first or second information is stored in said memory (66) at the time of input of said operation command signal.

2. An apparatus for preventing accidental operation of a loom according to claim 1, wherein said loom is a pile loom, and said operation preventing circuit prevents the loom from operating in case at the time of input of said operation command signal said first or second information is stored in said memory (66),

whether the time said abnormality detection signal was generated at a fast pick or at a loose pick.

3. An apparatus for preventing accidental operation of a loom, comprising: an abnormality detection sensor (34, 36, 38, 40) for detecting abnormality in weft insertion, weft (14) or warp (24); and a controller (46) for stopping the loom by an abnormality detection signal from said sensor (34, 36, 38, 40) and also starting running of the loom by an operation command signal from an operation command switch (68),

wherein said controller (46) includes: memory (66) for storing at least one of two pieces of information, which include first information representing that, after the loom is stopped by said abnormality detection signal, an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to remove a second weft one pick before a first weft inserted immediately before stopping is not performed, and second information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of the loom is not performed; and an operation preventing circuit for preventing the loom from starting running in case said first or second information is stored in said memory (66) at the time of input of said operation command signal.

4. An apparatus for preventing accidental operation of a loom, comprising an abnormality detection sensor (40) for detecting abnormality in selvedge yarn or a catch cord (24a); and a controller (46) for stopping the loom by an abnormality detection signal from said sensor (40) and also starting running of the loom by an operation command signal from an operation command switch (68),

wherein said controller (46) includes: memory (66) for storing at least one of two pieces of information, which include first information representing that, after the loom is stopped by said abnormality detection signal, an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to restore a broken yarn by a selvedge device or a yarn end disposing device respectively using said selvedge yarn or said catch cord (24a) is not performed, and second information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of loom is not performed; and an operation preventing circuit for preventing the loom from starting running in case said first or second information is stored in said memory (66) at the time of input of said operation command signal.

5. An apparatus for preventing accidental operation of a loom according to any one of claims 1 through 4, wherein said controller (46) further includes detection means for generating a detection signal for eliminating said first or second information in the memory (66) by detecting that the command signal for performing said normal rotation or reverse rotation was inputted or that said drive shaft was rotated.

6. An apparatus for preventing accidental operation of a loom, comprising: an abnormality detection sensor for detecting abnormality in weft to be supplied for weft insertion; and a controller for stopping the loom by an abnormality detection signal from said sensor and also for starting running of the loom by an operation command signal from an operation command switch (68),

wherein said controller includes: memory (66) for storing first information representing that, after the loom is stopped by said abnormality detection signal, an operation for setting the weft (14) in a weft length measuring storage unit (16) or a weft insert device is not performed, and an operation preventing circuit for preventing the loom from starting running in case said first information is stored in said memory (66) at the time of input of said operation command signal.

7. An apparatus for preventing accidental operation of a loom, comprising: a first abnormality detection sensor for detecting abnormality in weft insertion, weft (14) or warp (24); a second abnormality detection sensor for detecting abnormality in selvedge yarn or catch cord (24a); a third abnormality detection sensor for detecting abnormality in supplied weft to be supplied for weft insertion; and a controller for stopping the loom by the abnormality detection signal from said first, second or third abnormality detection sensor and also for starting running of the loom by an operation command signal from said operation command switch (68),

wherein said controller includes: means for storing;

at least one of two pieces of information, which include first information representing that, after the loom stopped by an abnormality detection signal from said first abnormality detection sensor, an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to remove the weft inserted immediately before stopping is not performed, second information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of the loom is not performed, third information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to remove second weft one pick before a first weft inserted immediately before stopping is not performed, and fourth information representing that an operation to have the drive shaft normally

rotate or reverse to a rotational angle to start running of the loom is not performed; and

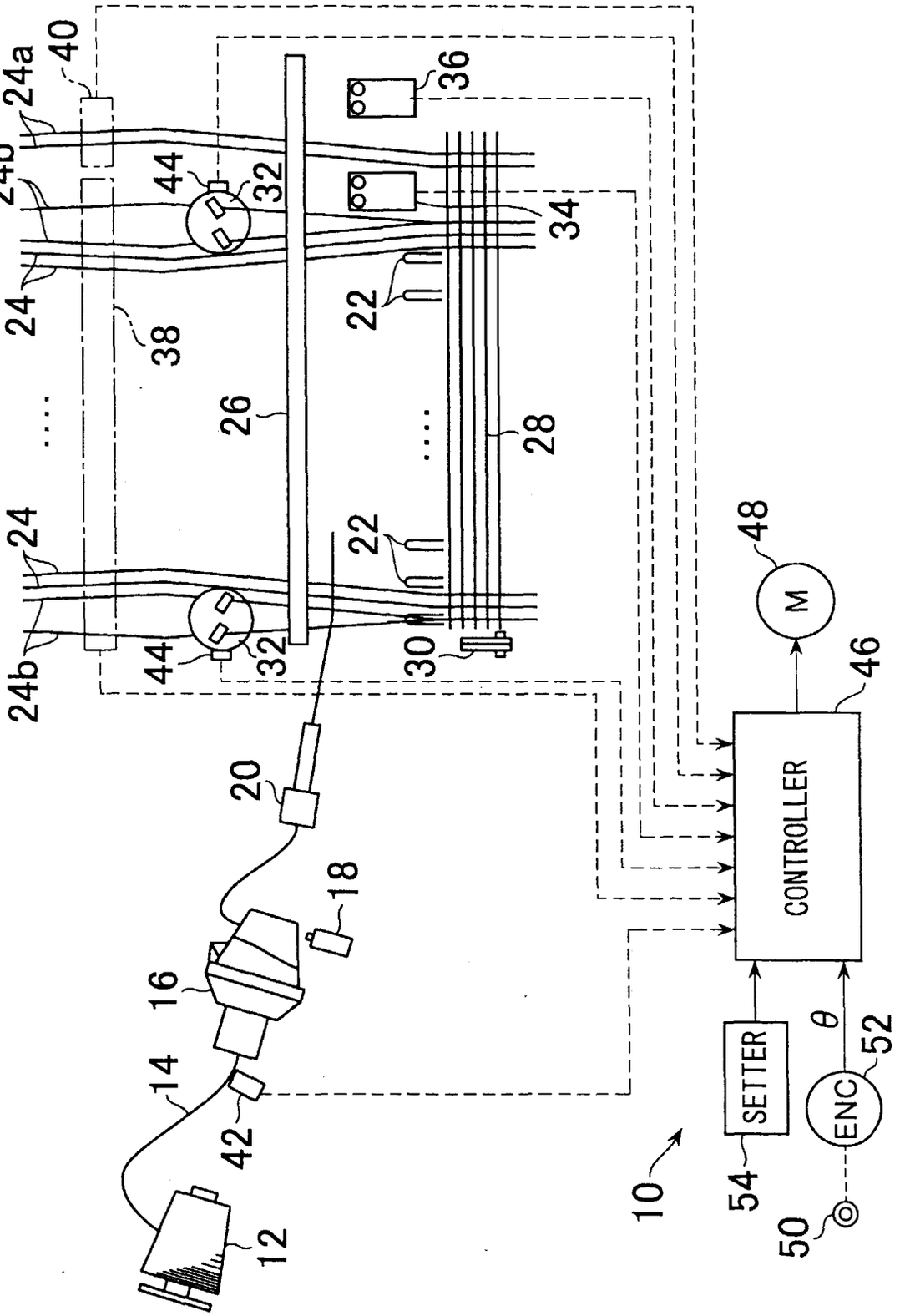
at least one of three pieces of information, which include fifth information representing that, after the loom is stopped by an abnormality detection signal from said second abnormality detection sensor, an operation to have a drive shaft of a shedding device (96) normally rotate or reverse to a rotational angle to restore a broken yarn by a selvedge device or a yarn end disposing device respectively using said selvedge yarn or said catch cord (24a) is not performed; sixth information representing that an operation to have the drive shaft normally rotate or reverse to a rotational angle to start running of the loom not performed; and seventh information representing that, after the loom is stopped by an abnormality detection signal from said abnormality detection sensor, an operation for setting the weft (14) in a weft length measuring storage unit (16) or a weft insert device is not performed; and

an operation preventing circuit for preventing the loom from starting running in case said first or second information is stored or said third or fourth information is stored and for preventing the loom from operating in case said firth or sixth information is stored or in case said seventh information is stored, at the time of input of said operation command signal.

8. An apparatus for preventing accidental operation of a loom, comprising: an abnormality detection sensor for detecting abnormality in weft (14) or warp (24); and a controller for stopping the loom by said abnormality detection signal and also for starting running of the loom by an operation command signal from an operation command switch (68),

wherein said controller (46) includes an operation preventing circuit for preventing the loom from starting operation when said abnormality detection signal is inputted at the time of input of an operation command signal.

FIG. 1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46
CONTROLLER
SETTER
54
θ
52
ENC
50

FIG. 2

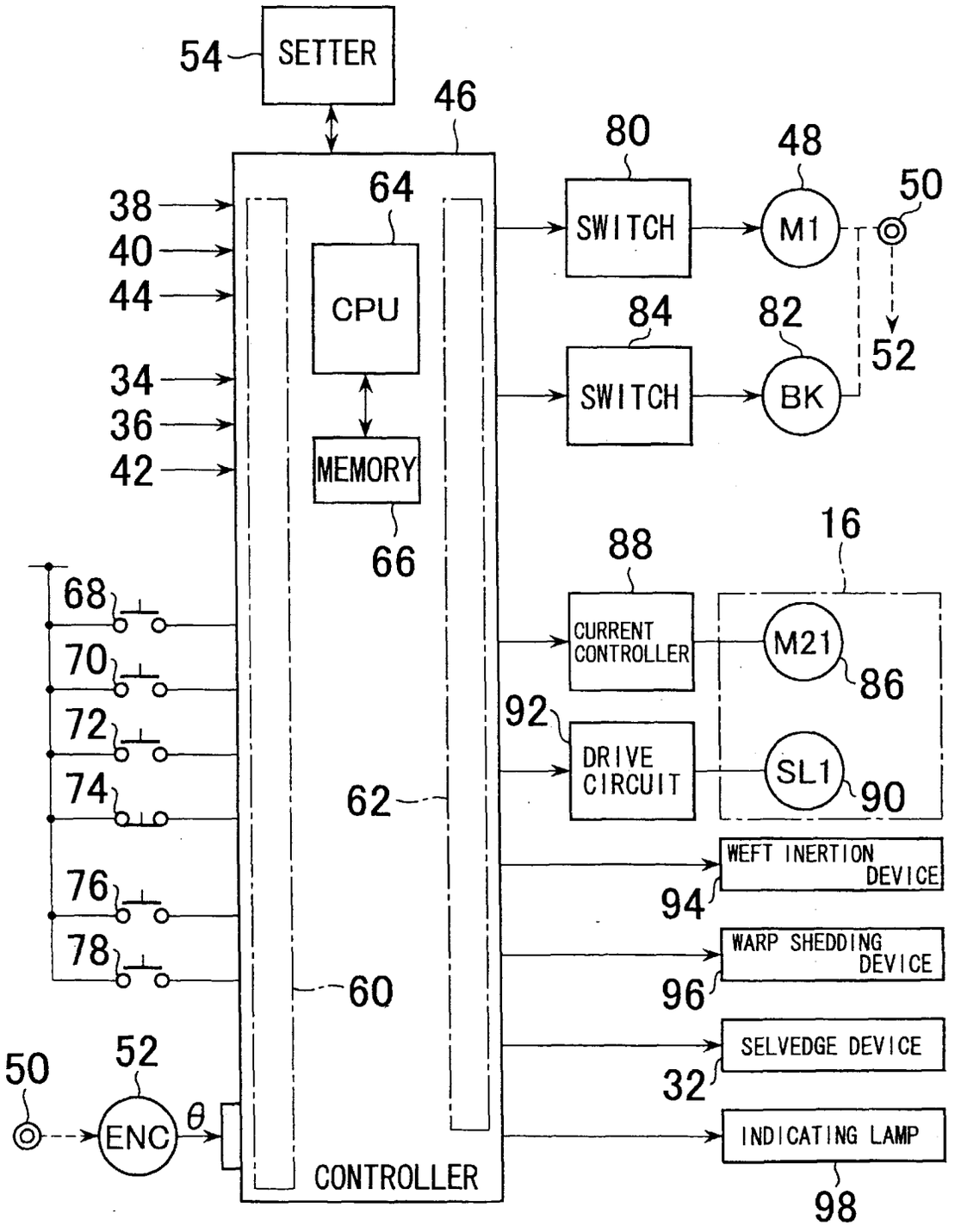

54
SETTER
46
80
48
50
38
40
44
64
SWITCH
M1
CPU
84
82
52
34
36
42
SWITCH
BK
MEMORY
66
16
88
68
70
72
74
76
78
CURRENT CONTROLLER
M21
86
92
DRIVE CIRCUIT
SL1
90
62
WEFT INERTION DEVICE
94
WARP SHEDDING DEVICE
96
60
SELVEDGE DEVICE
32
50
52
INDICATING LAMP
ENC
θ
CONTROLLER
98

FIG. 3

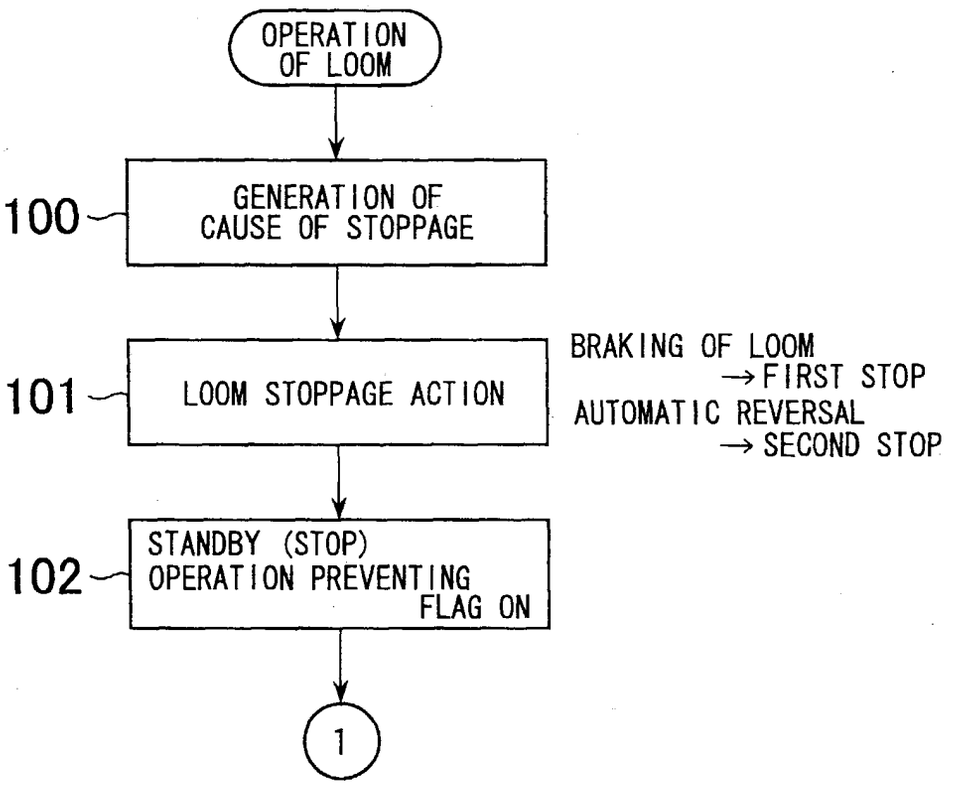

OPERATION OF LOOM
100
GENERATION OF CAUSE OF STOPPAGE
101
LOOM STOPPAGE ACTION
BRAKING OF LOOM → FIRST STOP
AUTOMATIC REVERSAL → SECOND STOP
102
STANDBY (STOP) OPERATION PREVENTING FLAG ON
1

FIG. 4

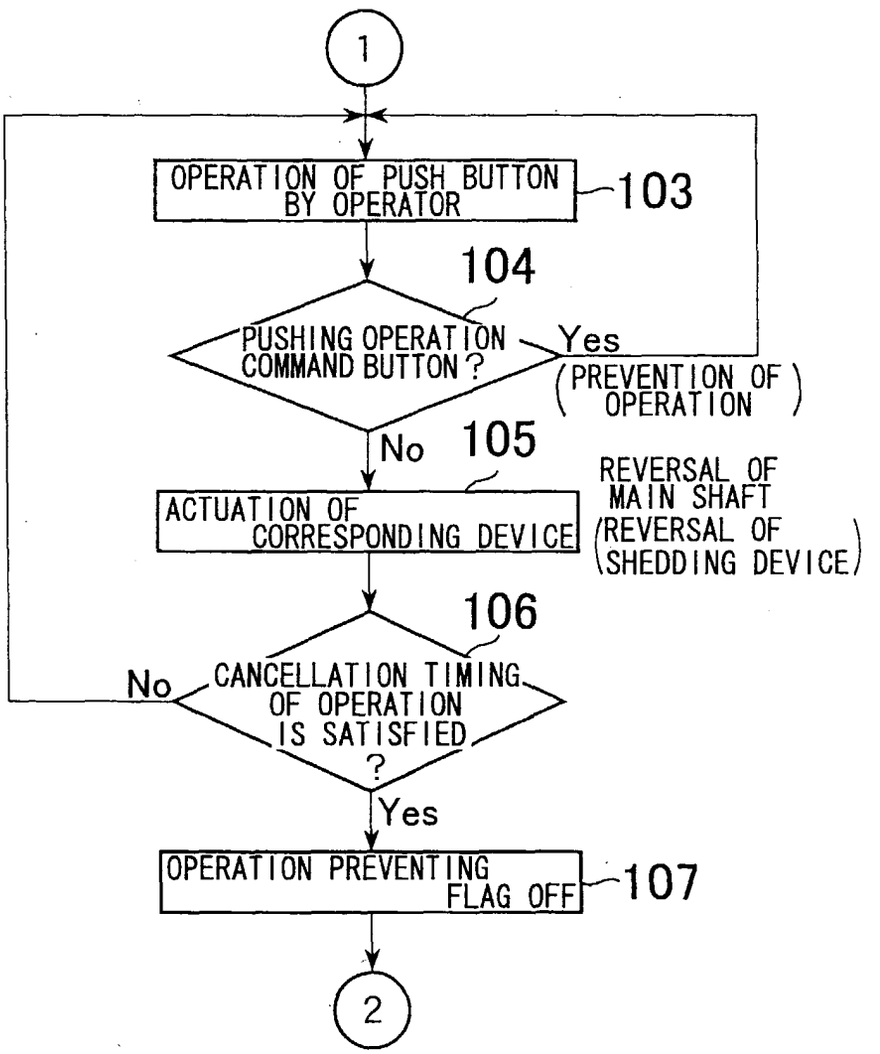

1
OPERATION OF PUSH BUTTON BY OPERATOR
103
104
PUSHING OPERATION COMMAND BUTTON ?
Yes
(PREVENTION OF OPERATION)
No
105
ACTUATION OF CORRESPONDING DEVICE
REVERSAL OF MAIN SHAFT (REVERSAL OF SHEDDING DEVICE)
106
No
CANCELLATION TIMING OF OPERATION IS SATISFIED ?
Yes
OPERATION PREVENTING FLAG OFF
107
2

FIG. 5

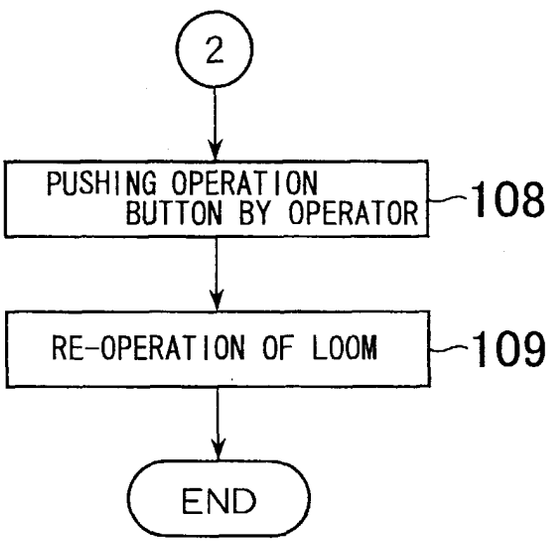

2
PUSHING OPERATION BUTTON BY OPERATOR
108
RE-OPERATION OF LOOM
109
END

FIG. 6 (A)

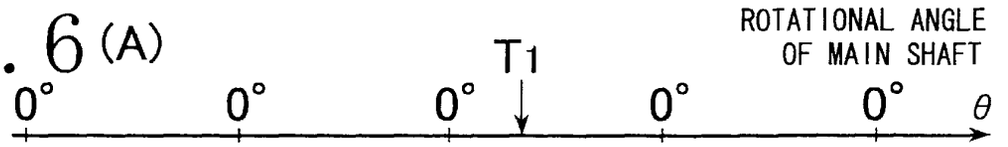


FIG. 6 (B)

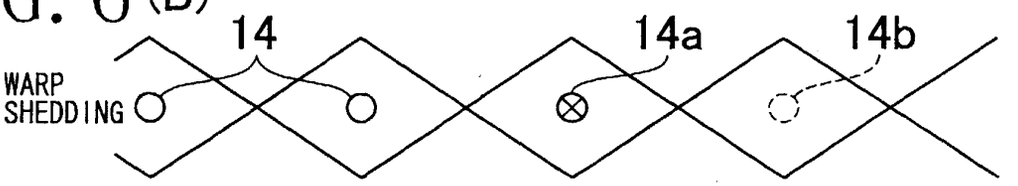


FIG. 6 (C)

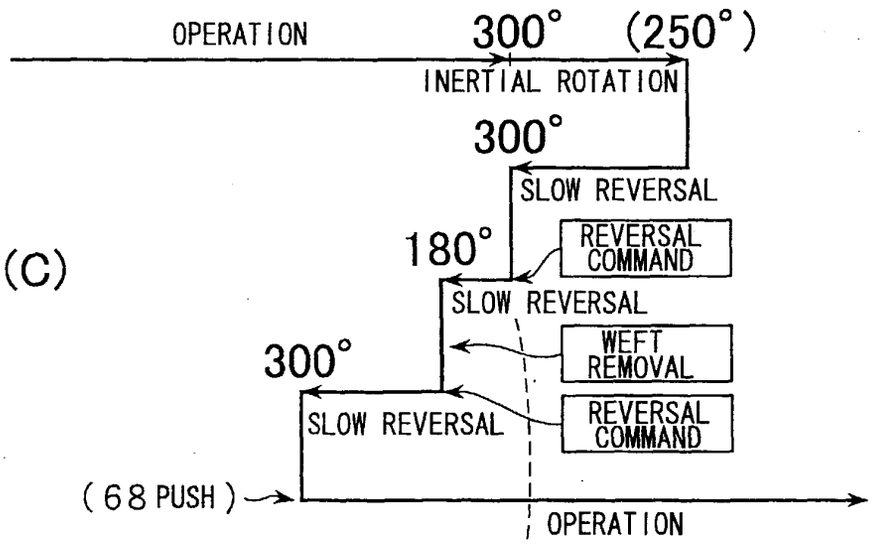


FIG. 6 (D)

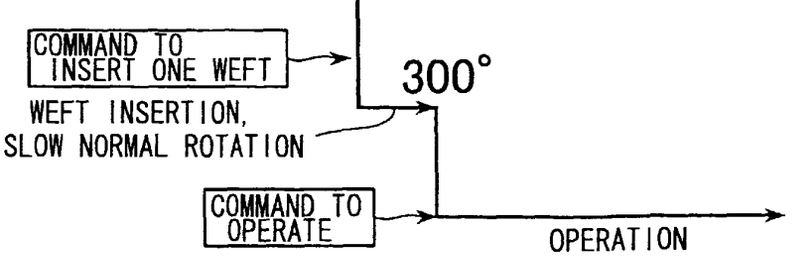


FIG. 7

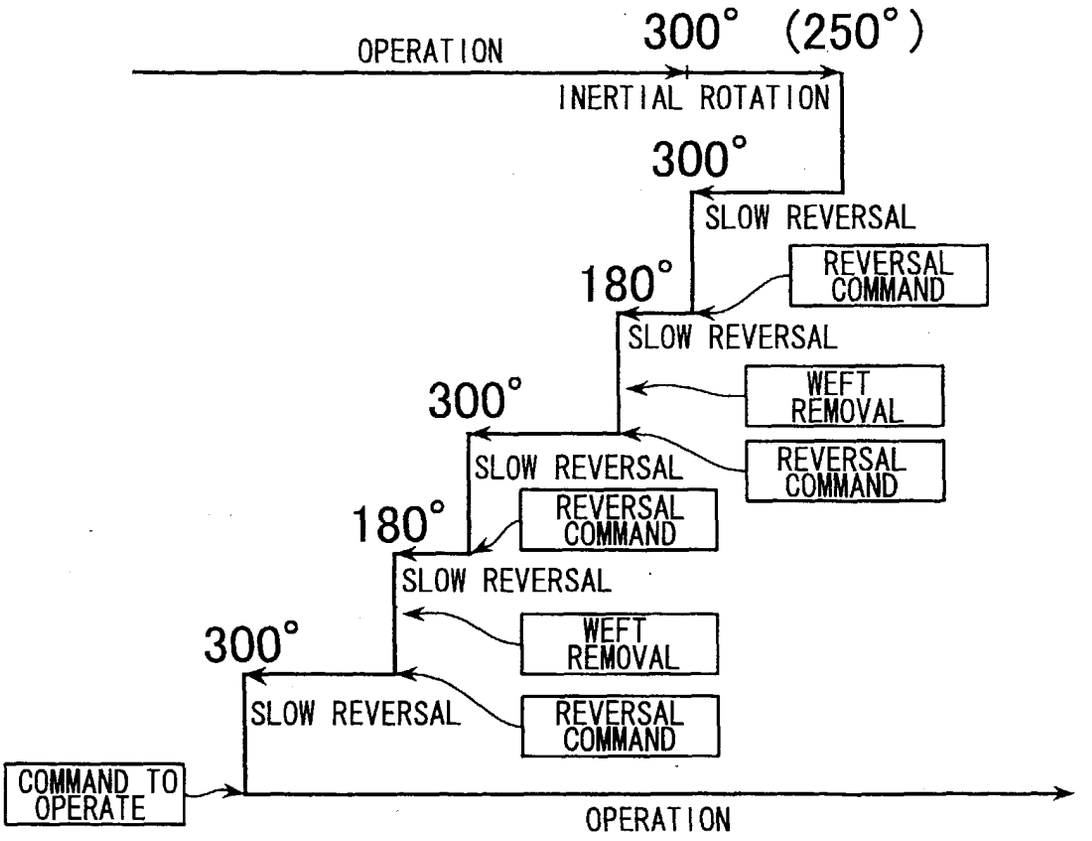

OPERATION
300° (250°)
INERTIAL ROTATION
300°
SLOW REVERSAL
REVERSAL COMMAND
180°
SLOW REVERSAL
WEFT REMOVAL
300°
SLOW REVERSAL
REVERSAL COMMAND
180°
REVERSAL COMMAND
SLOW REVERSAL
WEFT REMOVAL
300°
SLOW REVERSAL
REVERSAL COMMAND
COMMAND TO OPERATE
OPERATION

FIG. 8(A)

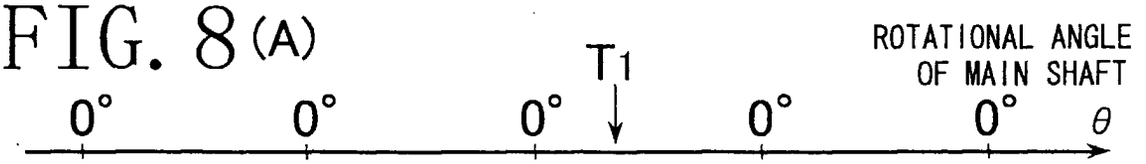


FIG. 8(B)

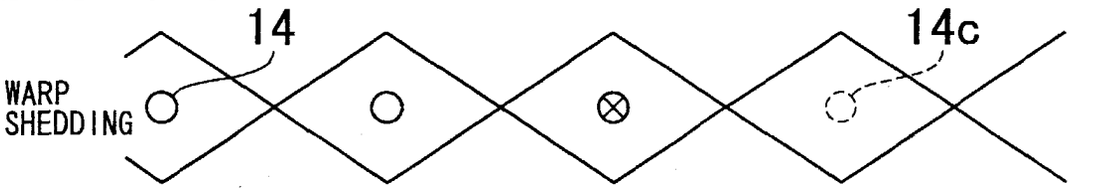


FIG. 8(C)

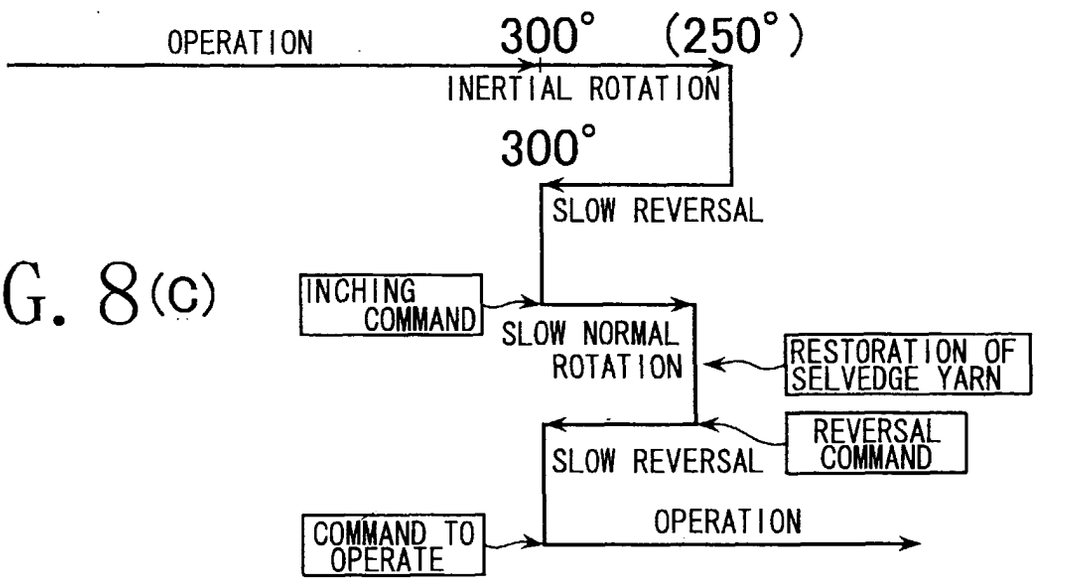


FIG. 9

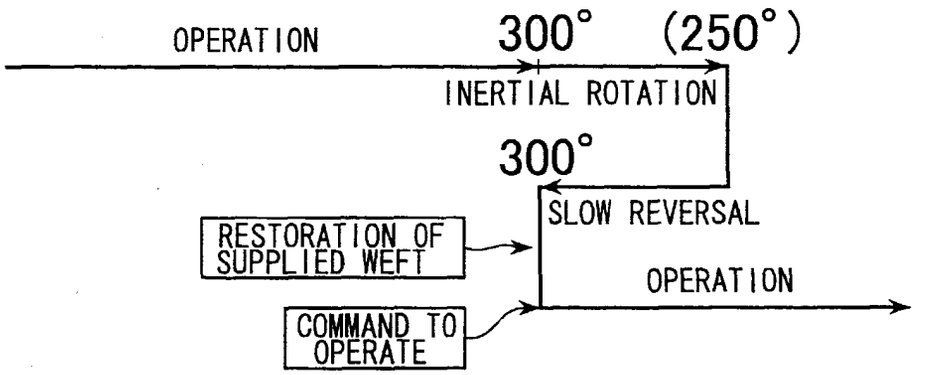

OPERATION
300°
(250°)
INERTIAL ROTATION
300°
SLOW REVERSAL
RESTORATION OF SUPPLIED WEFT
OPERATION
COMMAND TO OPERATE

FIG. 10

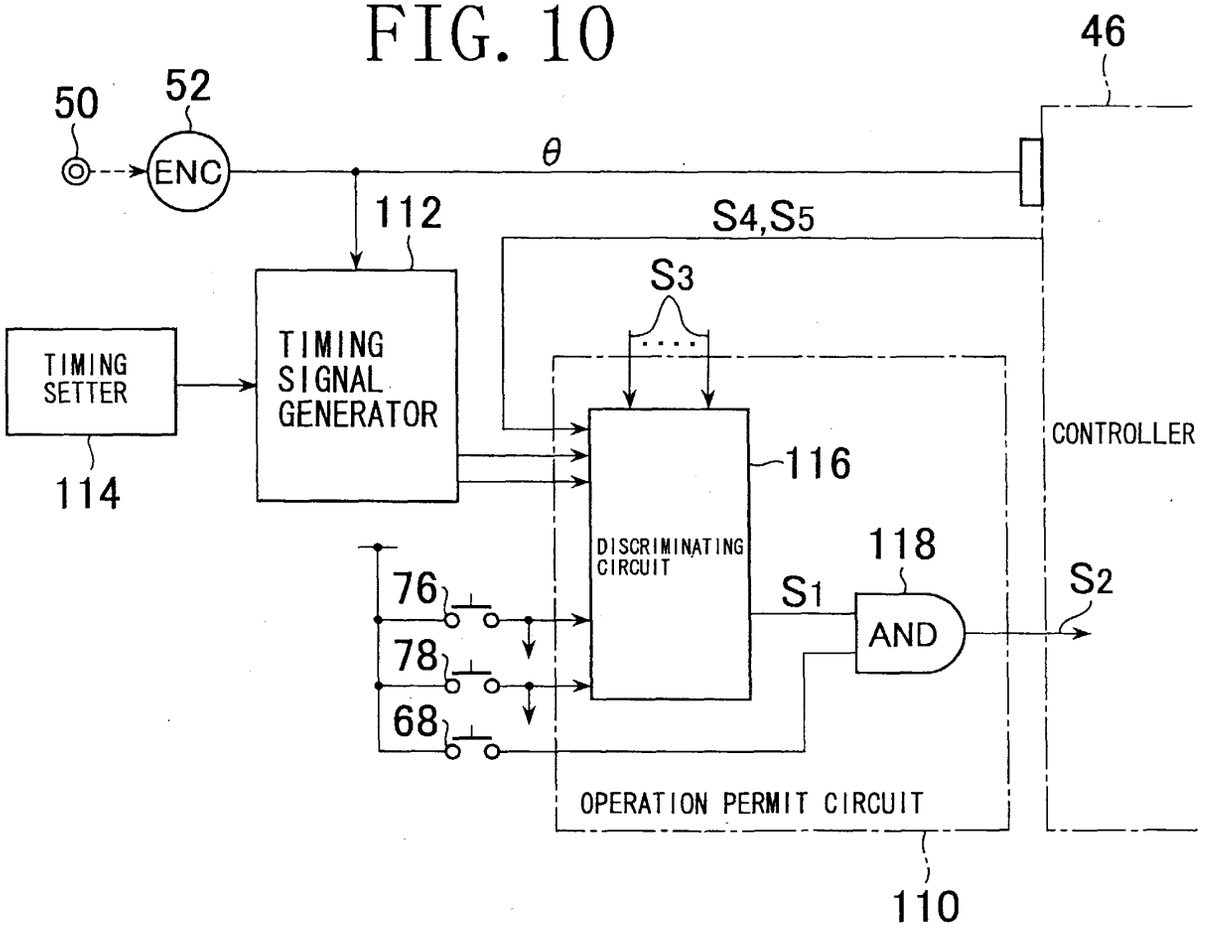

46
50
52
ENC
θ
112
S4,S5
S3
TIMING SETTER
TIMING SIGNAL GENERATOR
114
116
CONTROLLER
DISCRIMINATING CIRCUIT
118
S1
S2
AND
76
78
68
OPERATION PERMIT CIRCUIT
110

FIG. 11

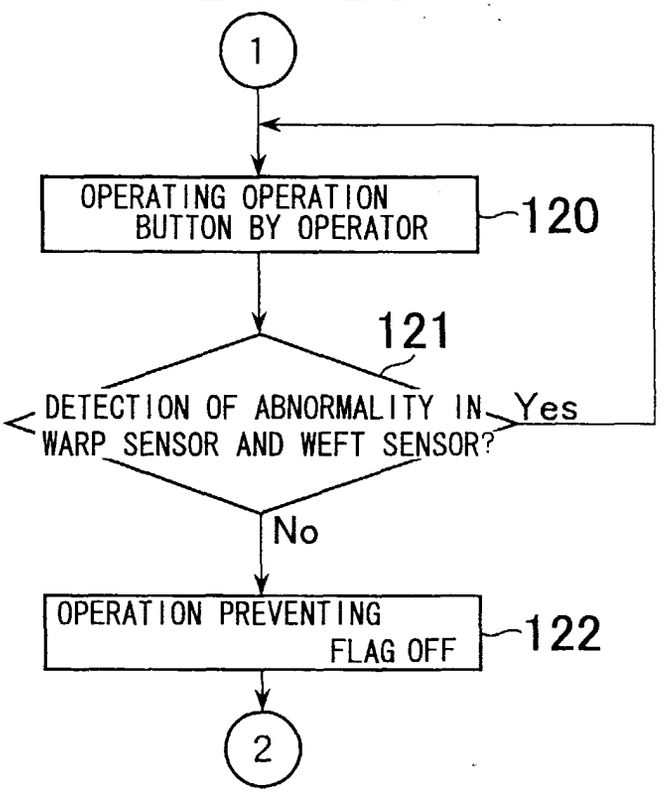
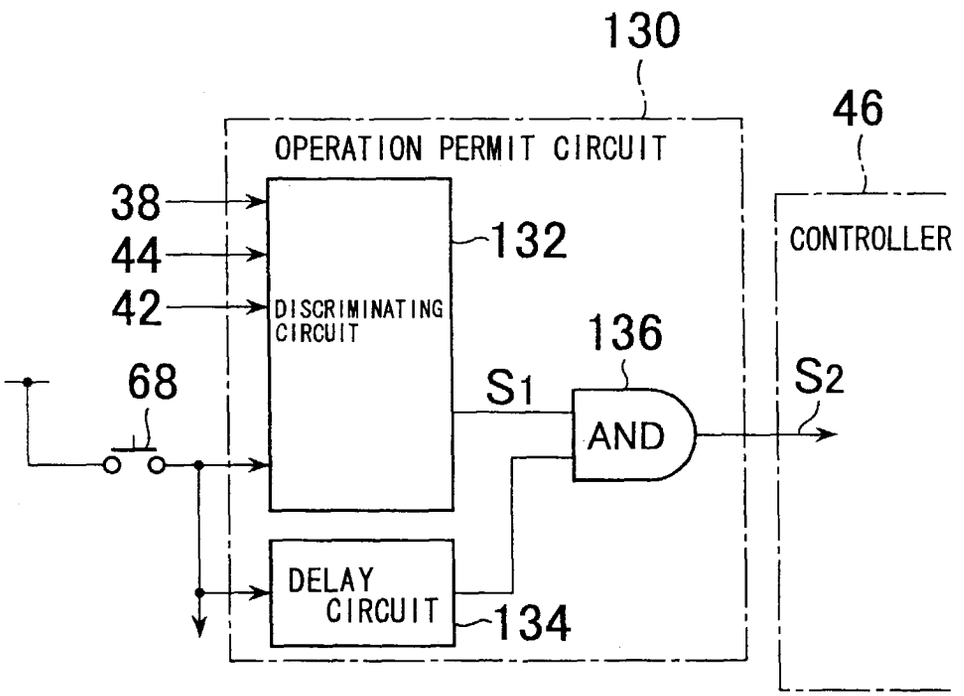

1
OPERATING OPERATION BUTTON BY OPERATOR
120
121
DETECTION OF ABNORMALITY IN WARP SENSOR AND WEFT SENSOR?
Yes
No
OPERATION PREVENTING FLAG OFF
122
2

FIG. 12


130
OPERATION PERMIT CIRCUIT
46
CONTROLLER
38
44
42
DISCRIMINATING CIRCUIT
132
136
68
S1
AND
S2
DELAY CIRCUIT
134

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 2053

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)
Y	EP 0 507 739 A (TOYODA AUTOMATIC LOOM WORKS) 7 October 1992 (1992-10-07) * column 4, line 21 - column 6, line 32; claims 1-4; figures 2,6,7 *	1,3,4, 6-8	D03D51/00 D03D51/18 D03D51/28
Y	US 5 165 454 A (KANAYAMA HIROYUKI ET AL) 24 November 1992 (1992-11-24) * column 10, line 24-40; figures 4A,4B *	1,3,4, 6-8	
A	US 5 487 413 A (HATAKEYAMA KUNIO ET AL) 30 January 1996 (1996-01-30) * claim 1; figure 1 *	1,3,4, 6-8	
A	US 4 248 272 A (WILSON MARLIN V ET AL) 3 February 1981 (1981-02-03) * column 5, line 11 - column 10, line 4; figures 3-5 *	1,3,4, 6-8	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	10 September 2003	Dreyer, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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10-09-2003

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