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Pfarrwaller

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[54] **MULTIPLE WEFT MECHANISM FOR A WEAVING MACHINE**

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June 30, 1970 Switzerland 9863/70

[52] **U.S. Cl.** ..... **139/122 W**

[51] **Int. Cl.** **D03d 47/34**

[58] **Field of Search** .... 66/50 R; 139/122 R, 122 W, 139/125, 126, 370

[56] **References Cited**

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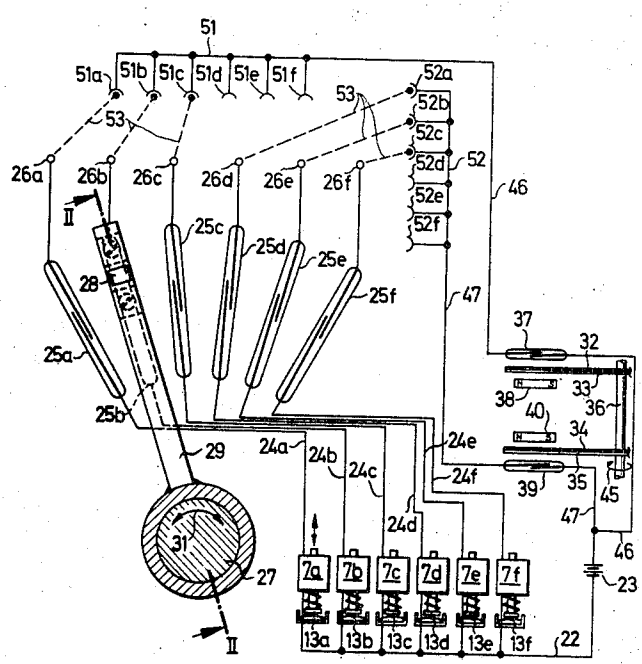
[57] **ABSTRACT**

The weft brake is released in programmed sequence to the weaving machine to allow picking of a selected weft and is reengaged in response to the lapse of a predetermined time interval. The time interval is determined by means of an adjustable gap formed by a pair of adjustable cam plates run off the main shaft wherein the gap serves to close the circuit to the weft brake. The time interval can also be terminated by an electronic or pneumatic means independently of the operation of the weaving machine.

14 Claims, 9 Drawing Figures



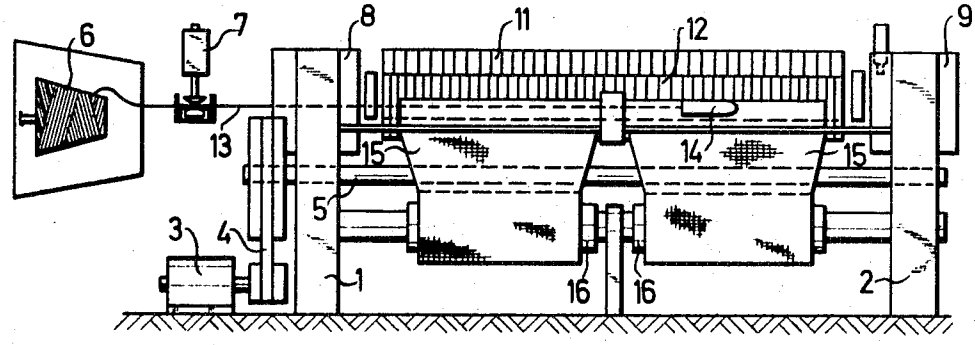


Fig. 1

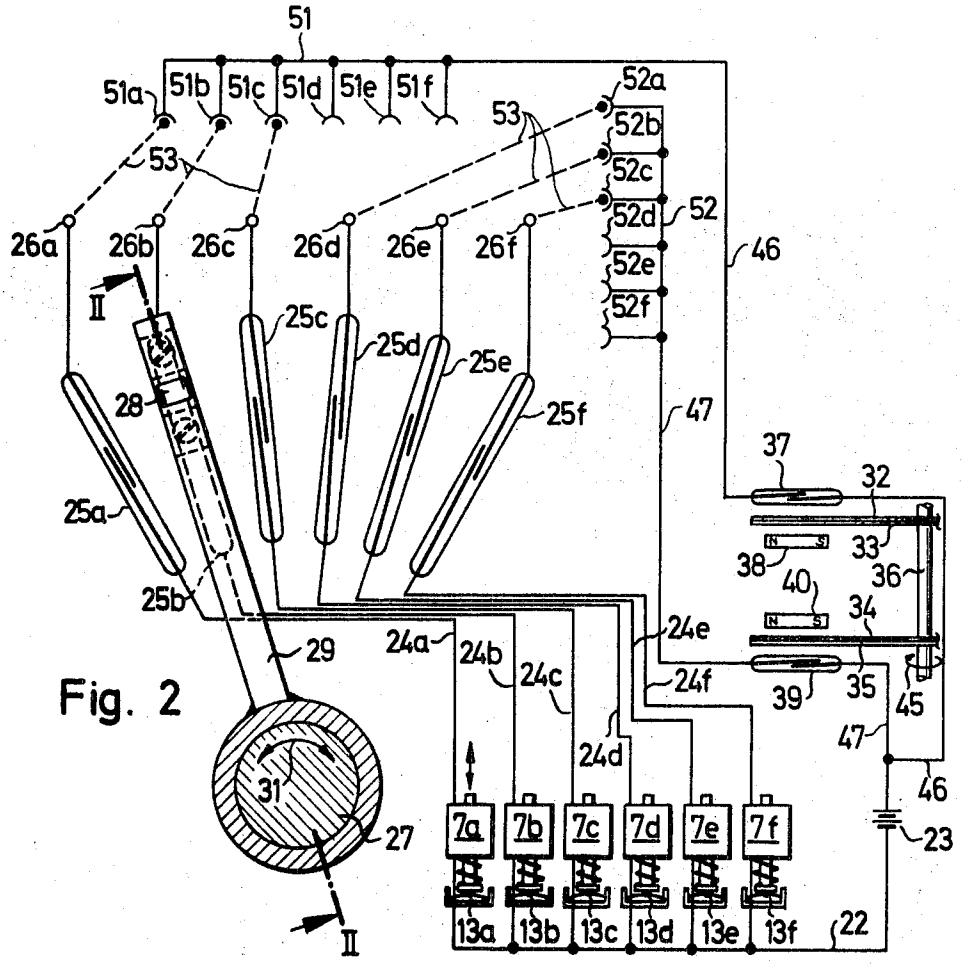


Fig. 2

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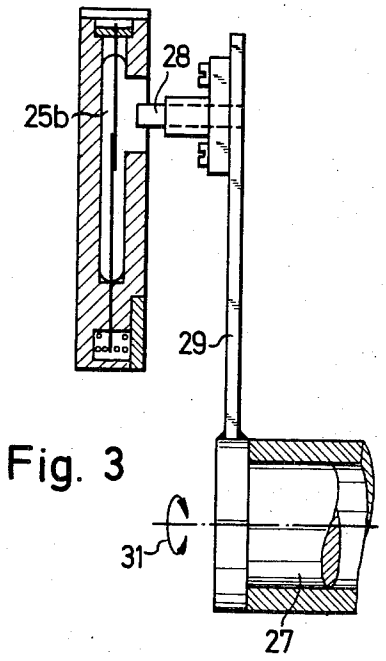

Fig. 3

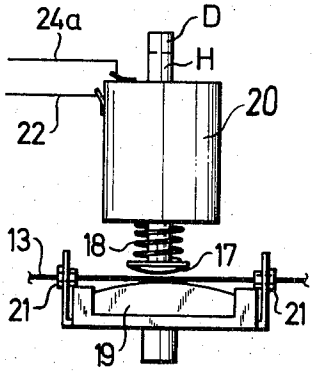

Fig. 4

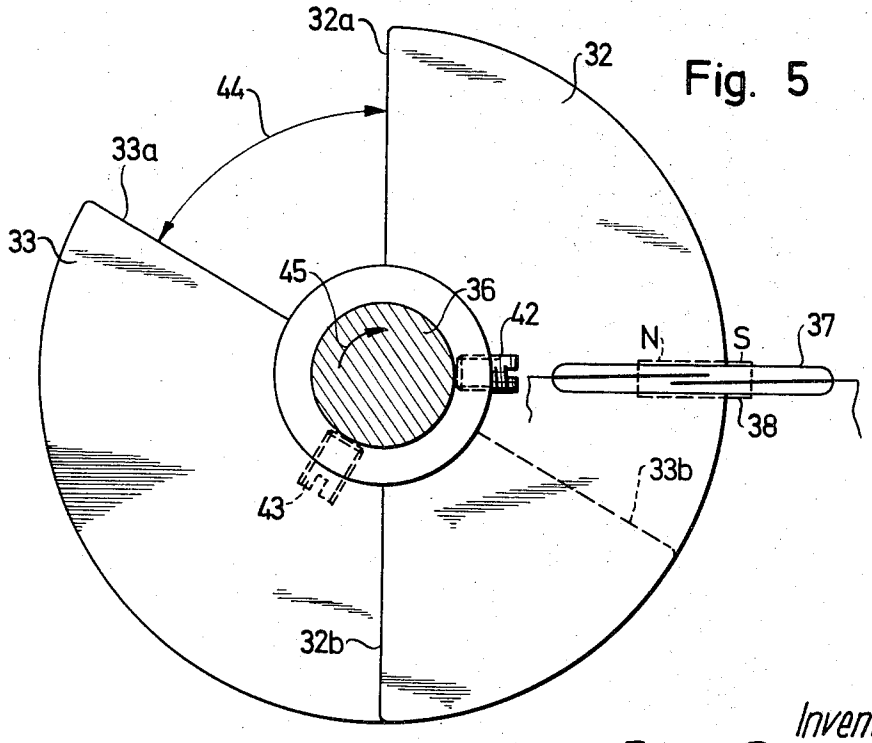

Fig. 5

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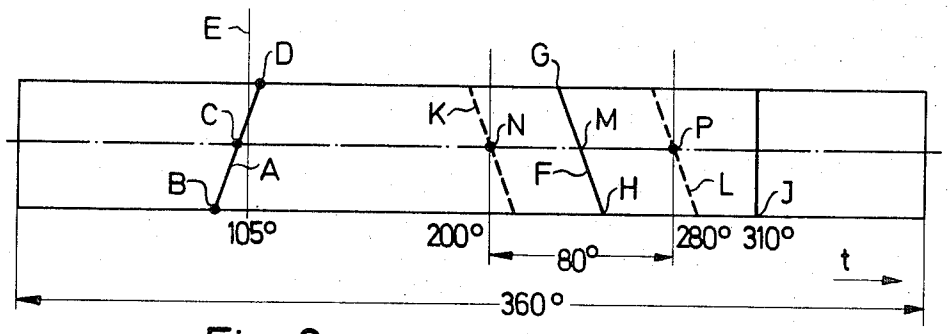

Fig. 6

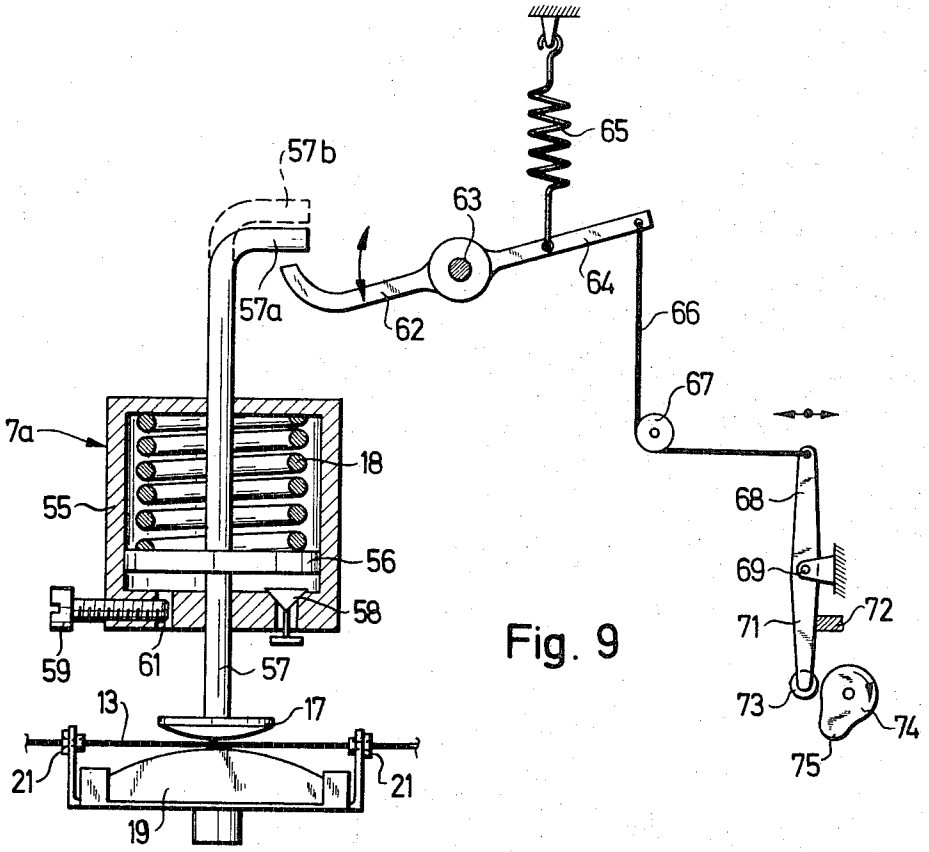

Fig. 9

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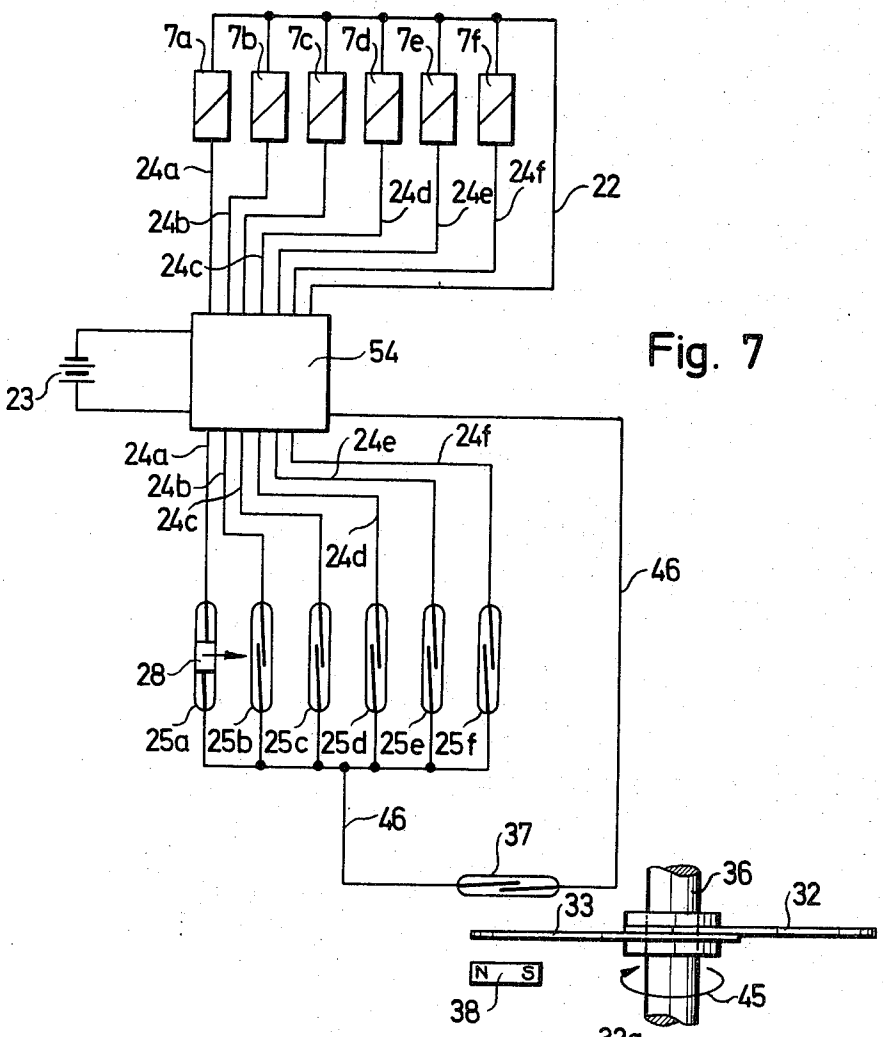

Fig. 7

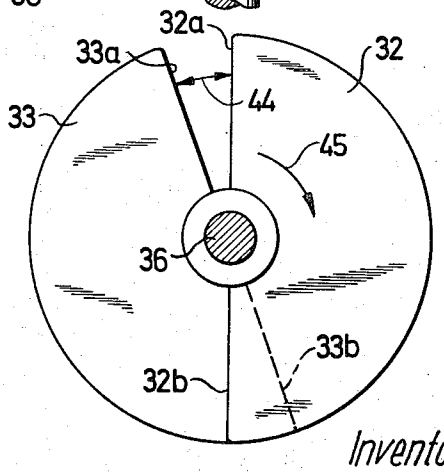

Fig. 8

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MULTIPLE WEFT MECHANISM FOR A WEAVING MACHINE

This invention relates to a multiple weft mechanism for a weaving machine. More particularly, this invention relates to a weft yarn brake of a weft mechanism for a weaving machine.

Multiple weft weaving machines have been known wherein a multiple weft yarn supply facility is positioned outside a shed along with a weft yarn brake facility. The yarn brake facility has usually been operated over an operative connection to the weaving machine so as to release an engaged weft yarn at the start of a picking operation. For example, the yarn brake facility has been connected via a cam which is driven by the main shaft of the weaving machine. In use, the cam has released the yarn brake at a particular instant of time during each cycle of operation and has applied the yarn brake at some other instant of time during the cycle. This latter instant of time has also been predetermined and has always been the same. The yarn brake release time has therefore always been of the same length and starts and ends at exactly the same instant of time, i.e., at the same angles of main shaft rotation, during each cycle.

In these known machines, neither the release time nor the instants of time at which braking starts can be varied. Consequently, these yarn brake facilities have not been able to efficiently operate when the weft yarns used have had different braking characteristics. For example, these facilities have been impractical where the weft yarns include yarns having little friction and a smooth surface, as is the case, e.g., for synthetic yarns, which permit the start-of-braking time at the end of picking to come sooner and yarn such as wool whose friction is greater and for which the start-of-braking time can occur later.

Accordingly, it is an object of this invention to provide a weaving machine with a yarn brake mechanism which can be used efficiently with a number of weft yarns of differing braking characteristics.

It is another object of this invention to effect the braking of a weft yarn at a predetermined point of time in a weaving machine.

It is another object of this invention to adjust the braking point of time of a weft yarn brake in a weaving machine.

Briefly, the invention provides a weft yarn brake mechanism for a multiple weft weaving machine in which the brake is released and reengaged in a predetermined timed sequence. In addition, the time of reengagement of the brake can be adjusted so as to vary the length of time the brake is disengaged and similarly, engaged.

In one embodiment, a series of weft yarn brakes are sequentially connected to an adjusting means within the brake mechanism which allows a number of different onset-of-braking times to be obtained for various winds of weft to be picked. For example, in the case of a six-weft machine wherein two kinds of cotton yarn of different color, one elastomeric yarn and three synthetic yarns are used as weft yarns, the start-of-braking time for the cotton yarns can readily be arranged to occur fairly late during the cycle, the start-of-braking time for the elastomeric yarn can be arranged to occur very early in the cycle and the start-of-braking time for the synthetics can be arranged to occur towards the middle of the cycle intermediately of the other two kinds of yarn.

In this embodiment, each weft yarn brake includes an electromagnet for moving a brake member against a brake bed to engage a yarn therebetween while the adjusting means includes an electrical circuit which is selectively connected to the electro-magnet of each brake so as to operate each electromagnet in proper sequence to release and thereafter engage a weft yarn. The circuit includes a variable means such as at least one double cam which is constructed with an adjustable portion such as a segmental gap and a switch which is activated by the cam so as to open and close the circuit to a respective electromagnet. This cam is rotated off the main shaft of the machine to time the operation of the electromagnet with the machine operation while the gap is arranged to time the length of time the switch is closed. The gap can be adjusted to vary the length of time the switch is closed and thus vary the time a weft yarn is free to pass through the brake. Where a pair of adjustable cams are used, one cam is connected to some of the brakes used to brake the wefts of a multiple weft supply having common braking characteristics while the other cam is connected to the brakes for the remaining wefts of different braking characteristics.

In another embodiment of the invention, the adjusting means can operate independently of the operation of the weaving machine. The advantage of this is that the picked weft is braked, for instance, even if the machine stops between the start of picking and the end of picking for some reason, for instance, a warp breakage, or if the machine must be moved on by hand for inspection or the like just far enough for the next pick to occur. In conventional weaving machines, there is no weft yarn braking in such cases. As a result, the weft yarn has the disadvantage of lying loose in the shed. The weft yarn must therefore either be removed from the shed before operation resumes or it must be tightened and retained manually while the machine is advanced manually until the weft-yarn brake becomes operative. Only then can the machine be restarted. If this procedure is not followed, the fabric has unwanted marks or other flaws at the place concerned.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a diagrammatic view viewed from the cloth end of a weaving machine incorporating a weft yarn brake mechanism according to the invention;

FIG. 2 illustrates a schematic diagram of an associated weft-yarn brake facility;

FIG. 3 illustrates a view taken on line II—II of FIG. 2;

FIG. 4 illustrates a view of a yarn brake according to the invention;

FIG. 5 illustrates a view of a double cam according to the invention;

FIG. 6 diagrammatically illustrates a cycle of the weaving machine;

FIG. 7 illustrates an actuation diagram of a modified embodiment according to the invention;

FIG. 8 illustrates a plan view of a corresponding detail of a double cam used in the mechanism of FIG. 7; and

FIG. 9 illustrates a modified yarn brake according to the invention.

Referring to FIG. 1, the weaving machine comprises a frame having two side members 1, 2, a driving motor 3, a driving belt 4 and a main shaft 5. The machine has a number of stationary weft-yarn supply bobbins 6 which remain outside the shed during operation and a corresponding numer of weft-yarn brakes 7. Only one of each of the bobbins 6 and brakes 7 are shown for simplicity. In addition, a picking mechanism 8 is disposed on the one side member 1 while a catcher 9 is disposed on the other side member 2. As is known, heald shafts 11 and a reed 12 are disposed between the side members 1 and 2 and a gripper shuttle 14 picks whichever weft yarn 13 is to be picked. The resulting fabric comprises two webs 15 which are wound on to two cloth beams 16.

The weaving machine is a 6-weft machine, i.e., six different kinds of weft yarn 13*a* to 13*f* (FIG. 2) are picked alternately in accordance with an operations program (weft repeat). Correspondingly, there are six weft-yarn brakes and they have the references 7*a* to 7*f* in FIG. 2.

Referring to FIG. 4, each brake 7 comprises an electromagnet 20, a part-spherical brake member 17 which is moved by and forms the armature of the electromagnet 20, a spring 18 which biases the member 17 downwards, as viewed, a brake bed 19 made of a resilient substance, for instance, foam rubber, and two yarn guides 21. The weft yarn 13 moves between the brake member 17 and brake bed 19.

As shown in FIG. 2, the yarn-brake electromagnets 20 are connected by a line 22 to a power supply 23 and are in parallel with one another. The electromagnets are also connected via lines 24*a* to 24*f* to respective reed switches 25*a* to 25*f* whose other sides extend to contacts 26*a* to 26*f*. In addition, an adjusting means for actuating the brakes 7 includes a shaft 27 which is coupled with a weft-changing mechanism (not shown) as is known and is operated correspondingly thereby. The adjusting means also includes a reed switch selector device which is mounted on the shaft to activate each switch 25, i.e., to actuate the brakes 7*a* – 7*s* in sequential manner. The device includes a pivot arm 29 which supports a permanent magnet 28 and which is pivoted reciprocatingly by the shaft 27 as indicated by arrow 31 so as to move the magnet 28 past the reed switch 25 corresponding to the particular kind of weft yarn concerned. It is assumed in the position shown in FIGS. 2 and 3 that the magnet 28 was operated immediately before reed switch 25*b*, and so the same is in the closed state in FIG. 3. When arm 29 moves magnet 28 past some other reed switch, the switch 25*b* opens and the other switch closes.

The adjusting means also comprises two double cams 32, 33 and 34, 35 which are shown in purely schematic form in FIG. 2 and which are secured to a shaft 36 running at the same speed as the machine main shaft 5. Cam 32, 33 cooperates with a reed switch 37 and associated permanent magnet 38, and cam 34, 35 cooperates with a reed switch 39 and associated permanent magnet 40.

Referring to FIG. 5, the cam 32, 33 comprises two disc segments 32, 33 which each extend over 180° and which are made of a magnetic substance such as steel. The segments 32, 33 are disposed immediately adjacent one another on shaft 36 and are secured to the shaft 36 by clamping screws 42, 43. Upon slackening of one or both screws 42, 43, the segments 32, 33 can be rotated relative to one another and moved to a new position, thus leaving a variable sector-shaped gap 44.

In use, when the disc segments 32, 33 are rotated by the shaft 36 in the direction indicated by an arrow 45, edge 32*a* of segment 32 first moves past reed switch 37, with the result that magnet 38 then closes switch 37. After further rotation by an amount corresponding to the gap 44, edge 33*a* of segment 33 moves past switch 37. The magnetic segment 33 then moves between the switch 37 and magnet 38 so that switch 37 re-opens. The two edges 32*b*, 33*b* of the segments 32 and 33 are inoperative.

The double cam 34, 35 is of identical construction and operates in the same way as the cam 32, 33 except that the sector-shaped gap 44 of cam 34, 35 is larger or smaller than the gap 44 of the device 32, 33.

Referring again to FIG. 2, the reed switch 37 is connected via a line 46 to the power supply 23 and reed switch 39 is connected thereto via a line 47. The switches 37, 39 are thus in parallel with one another. The lines 46, 47 continue beyond the switches 37, 39 to terminals 51, 52 having six selectable contacts 51*a*–51*f* and 52*a*–52*f*, respectively. The contacts 26*a*–26*f* can be selectively connected via connecting lines 53 (shown in chain lines) to the contacts 51*a*–51*f* and 52*a*–52*f*, so that some of the reed switches 25*a*–25*c* can be connected, in series with the reed switch 37, to one cam 32, 33 while some of the other switches 25*d* to 25*f* can be connected, in series with reed switch 39 as shown.

In operation, before a weft yarn 13 is picked, the weft-changing mechanism moves into the picking line of whichever weft yarn or yarn take-up device is required in accordance with the weft pattern repeat. Preparations are then made for yarn transfer to shuttle 14 as is known. Also, the weft-changing mechanism moves magnet 28 of the selector mechanism shown in FIGS. 2 and 3 past the reed switch, e.g., the reed switch 25*b*, corresponding to the particular weft yarn concerned. Reed switch 25*b*, therefore, closes, thus preparing weft-yarn brake 7*b* for release.

Edge 32*a* of segment 32 then moves past reed switch 37 so that the switch 37 closes. The control or actuating circuit formed by the components 32, 7*b*, 24*b*, 25*b*, 46 and 37 closes so that reed switch 25*b* is energized. Brake 7*b* then releases. The brake member 17 then moves as indicated by line A in FIG. 6, from its "on" position B through its central position C, in which the brake member 17 and bed 19 merely contact one another lightly, into the "off" position D. Shuttle 14 simultaneously engages the weft yarn. Picking then begins between the positions C and D, for instance, at 105° of main-shaft rotation, the shuttle being shot at position E.

During flight and picking, the cam 32, 33 continues to rotate, and shortly before the end of picking, the edge 33*a* passes by the reed switch 37. Shuttle 14 enters the catcher 9 at about the same time. During or shortly before the shuttle 14 is braked in the catcher 9, the passing of the segment 33 between the switch 37 and magnet 38 opens the reed switch 37, so that the control circuit is de-energized. As line F indicates, the spring 18 moves brake member 17 from position G to position H. The actual start-of-braking time is at the central position M at which the brake member 17, yarn

13*b* and bed **19** just touch for the first time. In the example considered, the weft-yarn brake **7***b* is fully "on" at about 250°. The shuttle **14** stops completely at position J, i.e., at about 310°.

In order to adjust the cam **32, 33,** the segment **32** is first adjusted to place the edge **32***a* in some appropriate angular position shortly before the start of picking; this position is found by experience. Segment **33** is then adjusted to leave open the segmental gap **44** which corresponds to the picking time. The minimum gap size corresponds to the earliest brake application time N for the weft yarn, represented by line K, whereas if the gap **44** is fairly large, the start P of the brake application time is very late, being represented by line L. In the example under consideration, the braking range between the lines K and L is 80°.

It is assumed in the example in FIG. **2** that the yarn types **13***a* to **13***c* which correspond to the brakes **7***a* to **7***c* and to the reed switches **25***a* to **25***c* are braked with the cam **32, 33** at one setting, whereas the yarns **13***d* to **13***f* which correspond to the brakes **7***d* to **7***f* and to the reed switches **25***d* to **25***f* are braked at a second setting associated with the cam **34, 35.** The delay time for brakes **7***a* to **7***c* can be, e.g., 100 milliseconds, corresponding to the section between the lines C and M in FIG. **6,** and the delay interval for the brakes **7***d* to **7***f* can be, e.g., 130 milliseconds and corresponds to the section between the lines C and P.

Of course, if more cams **32, 33** and **34, 35** and associated reed switches and permanent magnets are provided, more kinds of weft yarn can be braked for instance, each of the **6** kinds of weft yarn can be braked at a particular time.

Referring to FIGS. **7** and **8,** wherein like reference characters indicate like parts as above, the adjusting means can alternatively include a power supply **23** which supplies power to an electronic control means **54** to which connecting wires **24***a* to **24***f* for connecting the yarn brakes **7***a* to **7***f* to the reed switches **25***a* to **25***f* are connected. The selector device is the same as in FIG. **2** and is indicated only by the moving permanent magnet **28.** For the rest, only a single two-segment cam **32, 33** is provided. The gap **44** is much smaller than is the case in FIG. **5.** The control means **54** is constructed, as shown, with the lines **22** and **46** connected thereto and with a delay facility (not shown) therein. The delay facility connects with the lines **24***a*–**24***f* and the power supply **23** in any suitable manner so as to effect a delay in the time the brakes **7***a*–**7***f* remain energized, i.e., open. The time delay for each brake **7** can be suitably adjusted independently of the others or can be adjusted in common with a number of the others. The delay facility for each brake **7** and line **24** is actuated upon closing of the respective switch **25** in the line. Thus, de-energization of the brakes **7** does not depend on the time at which the edge **33***a* of the cam **32, 33** passes by the switch **37** causing closing of the switch **37.**

In operation, shortly before the shuttle **14** is shot from the mechanism **8,** the edge **32***a* of segment **32** passes by reed switch **37.** The switch **37** therefore closes and, since magnet **28** is in front of reed switch **25***a*, brake **7***a* releases. Shortly thereafter, the shuttle **14** is picked into the shed. Edge **33***a* moves past reed switch **37** immediately after picking, so that switch **37** opens and a delay facility for the respective brake **7***a* and forming part of the electronic control means **54** starts. Depending upon the adjustment of the delay facility, brake **7***a* is deenergized after a short time, as a rule, at a time, for instance, about the position C (FIG. **6**) when the shuttle is a short distance away from the catcher **9,** and can therefore be reapplied by spring **18.**

Shortly before the next pick, and with the reed switch **37** open, the weft-changing mechanism moves the magnet **28** past another reed switch, for instance, switch **25***d*, so that the switch **25***d* closes, thus preparing for the release of the associated yarn brake **7***d*. The brake **7***d* therefore opens when the edges **32***a*, **33***a* pass by, and the delay facility for brake **7***d* in the control menas **54** reapplies the brakes shortly afterwards, and so on.

The control means **54** can be so devised that the same delay time can be set for all or some of the yarn brakes **7***a* to **7***f*, so that the yarn brakes concerned all close at the same time after the edge **33***a* has passed by the switch **37.** Alternatively, the control means **54** can be such that the brake application delay time for each brake can be adjusted separately to a special value somewhere between the position K and L to suit the particular kind of yarn concerned. For instance, if in the example just mentioned, the yarn brakes **7***a* and **7***b* are associated with two kinds of cotton yarn of different colors but of the same thickness whereas yarn brake **7***c* is associated with a rubber yarn and yarn brakes **7***d* to **7***f* are associated with three synthetic yarns, the delay in brake application after the edge **33***a* passes by the switch **37** can be, e.g., 130 milliseconds for brakes **7***a* and **7***b*, 80 milliseconds for brake **7***c* and 100 milliseconds for brakes **7***d* to **7***f*.

In FIGS. **7** and **8,** the cam **32, 33** does not determine the delay interval but instead determines only the start of the delay interval whereas the end of the delay interval is determined by the control means **54.** This embodiment therefore operates independently of the running of the weaving machine, i.e., the yarn brakes **7***a* to **7***f* are applied at the predetermined time even though the machine should be stopped for any reason, such as a warp yarn breaking, immediately after the picking of the shuttle **14.** In the case of the structure of FIGS. **2** and **3,** the yarn brakes **7***a* to **7***f* would not be reapplied since the cams **32, 33** and **34, 35** stop when the machine does, with the result that the braking signal which the edge **33***a* is adapted to trigger cannot be produced.

Referring to FIG. **9,** wherein only the brake **7***a* is shown for simplicity, the brakes can also be operated pneumatically. As shown, each yarn brake **7,** comprises a cylinder **55** and, reciprocable therein, a piston **56** mounted on a piston rod **57** bearing a braking member **17.** Cylinder **55** has a check valve **58** for the intake of air and is formed with a constricted orifice **61** which is adjustable by a screw **59** for expelling air as the piston **56** moves downwardly, as viewed, under the force of the spring **18.**

The piston rod **57** terminates at the top in a bent part **57***b* and cooperates with a lever arm **62** which is mounted for pivoting on a pivot **63** and which continues as a second arm **64.** A spring **65** is connected to the lever **62, 64** to pivot the lever **62, 64** anticlockwise. In addition, a pull cable **66** is secured to the end of arm **64** and runs over a deflecting roller **67** to an arm **68** of a double-armed rocking lever **68, 71** mounted at a pivot **69.** When in the position shown, the arm **71** is in engagement with an abutment **72.** The arm **71** carries a roller **73** which cooperates with a cam **74** having a camming surface **75.** A similar linkage is associated

with each yarn brake 7; however, only a single cam 74 which can move in a direction perpendicular to the plane of the drawing is used for all the linkages. This cam 74 therefore cooperates with any one arm or lever 71 at a time.

In operation, before the shuttle 14 is shot from the mechanism 8, the cam 74 is moved by a suitable means below whichever lever 71 corresponds to the next weft to be picked in accordance with the pattern. Camming surface 75 of cam 74 then engages with roller 73, with the result that the lever system 68, 71 and the lever 62, 64 pivot clockwise. The bent end 57*a* of piston rod 57 is therefore moved into the top chain-line position 37*b*, corresponding to the line A in FIG. 6; member 17 therefore also rises and the yarn brake 7*a* moves into the open or release position D. At this time, air is drawn into the cylinder 55 via the check valve 58. Shuttle 14 is shot immediately after (position E) and the yarn 13 is picked into the shed. After some time (line F) and shortly before entry of the shuttle into catcher 9, the air in the cylinder 55 is forced out via the orifice 61, due to the biasing force of the spring 18 on the piston 56, and the brake member 17 re-engages with bed 19 (position M), i.e., braking of the yarn 13 starts.

The delay between engagement of camming surface 75 with roller 73 and the engagement of brake member 17 with bed 19 (section between the lines A and F) can be adapted to suit requirements by adjustment of the screw 59, the time at which braking starts varying with the size of the flow cross-section of the orifice 61.

A different delay can be selected for each of the six brakes 7*a* to 7*f*, i.e., braking can start at different times for each of the brakes. Like the electronic facility shown in FIGS. 7 and 8, the start-of-braking time at the end of picking is, with the facility shown in FIG. 9, independent of the running of the weaving machine, i.e., if the same stops for any reason, e.g., immediately after the shooting of the shuttle, so that the cam 74 ceases to rotate, the various brakes 7*a* to 7*f* are still reapplied at the predetermined time.

It is noted that the embodiment of FIG. 9 is also suitable for hydraulic operation.

It is also noted that the segmental gap 44 of the embodiment of FIGS. 7 and 8 can be so short, for instance, that the signal termination produced by edge 33*a* for opening the reed switch 37 and the simultaneous signal for starting the delay facility in the control means 54 can occur even before the shuttle 14 has been shot.

What is claimed is:

1. A weft yarn brake mechanism for a multiple weft weaving machine comprising

a series of weft yarn brakes, each brake having an off position for releasing a weft yarn therefrom and an on position for engaging a weft yarn therein during a picking operation; and

an adjusting means including a selector device selectively connected to each brake for releasing said brakes in sequential manner into a respective off position and means connected to each brake for adjusting the onset of said on position of each brake relative to the other brakes to initiate braking of a respective yarn during a picking operation at a time different from the other yarns.

2. A weft yarn brake mechanism as set forth in claim 1 wherein said adjusting means is selectively connected to each brake to vary said on position of each brake independently of the remaining brakes.

3. A weft yarn brake mechanism as set forth in claim 1 wherein said adjusting means includes an electrical circuit connected to each brake; at least two reed switches connected in parallel in said circuit, one of said reed switches being selectively connected to at least one of said brakes and the other of said reed switches being selectively connected to others of said brakes; at least a pair of permanent magnets, each magnet being positioned adjacent a reed switch to close said reed switch; and wherein said means connected to each brake includes at least two disc cams, each cam being rotatably positioned between a reed switch and an adjacent magnet and having an adjustable gap therein for periodically exposing said magnet to said adjacent reed switch upon rotation of said cam to close said switch whereby said electrical circuit to a respective brake is completed.

4. A weft yarn brake mechanism as set forth in claim 1 wherein said adjusting means is an electronic control means and said means connected to each brake is a delay facility in said control means for delaying the onset of said on position of said brakes.

5. A weft yarn brake mechanism as set forth in claim 1 wherein said means connected to each brake includes a piston connected to a respective brake to move said brake between said off position and said on position, a cylinder slidably mounting said piston therein, means for supplying a pressure medium into said piston during movement of said brake to said off position, and means for adjustably throttling the flow of pressure medium from said cylinder during movement of said brake to said on position.

6. In combination,

a multiple weft weaving machine having a main shaft;

a plurality of weft supply bobbins for supplying weft yarns to said machine for picking operations therein;

a plurality of yarn brakes, each yarn brake being positioned between said machine and a respective one of said bobbins to engage a weft yarn therein at an on position thereof and to release a weft yarn therefrom at an off position thereof; and

an adjusting means connected to said yarn brakes for moving each said yarn brake between said positions, said adjusting means being connected to said shaft to move a respective yarn brake into said off position at the start of a picking operation and having a variable means therein for adjusting the onset of the movement of said yarn brake into said on position at the end of the picking operation.

7. The combination as set forth in claim 6 wherein said adjusting means includes an electrical circuit selectively connected to each brake; and said variable means includes a pair of switches connected in parallel in said circuit, one of said switches being connected to one of said brakes and the other of said switches being connected to another of said brakes, and a pair of disc cams, each of said disc cams being constructed to selectively open and close a respective one of said switches and including an adjustable portion for adjusting the onset of closing of a respective switch to initiate movement of a respective yarn brake into said on position.

8. The combination as set forth in claim 7 wherein each disc cam includes a pair of rotatable segmental discs disposed to define an adjustable segmental gap therebetween defining said adjustable portion and

wherein each said switch includes a reed switch and a permanent magnet disposed on opposite sides of a respective disc cam whereby rotation of said disc cam between said reed switch and magnet allows said gap to expose said magnet to said reed switch to close said reed switch and complete the electrical circuit through a respective yarn brake to move said yarn brake to said off position.

9. The combination as set forth in claim **6** wherein said variable means is operated independently of said machine to initiate movement of a respective yarn brake into said on position.

10. The combination as set forth in claim **6** wherein said variable means includes an electronic control means having a delay facility therein for delaying the onset of the movement of a respective yarn brake into said on position thereof.

11. The combination as set forth in claim **6** wherein said variable means includes a piston connected to a respective brake to move said brake between said off position and said on position, a cylinder slidably mounting said piston therein, means for supplying a pressure medium into said piston during movement of said brake to said off position, and means for adjustably throttling the flow of pressure medium from said cylinder during movement of said brake to said on position.

12. The combination as set forth in claim **6** wherein said adjusting means further includes a weft selector device for selecting a respective weft from one of said supply bobbins for a picking operation on said machine, and wherein said brakes are connected in parallel to said adjusting means and said selector device is selectively connected in series with a respective brake.

13. A multiple weft weaving machine having means for forming a shed, a plurality of weft yarn supply bobbins outside said shed; a weft yarn brake mechanism including a plurality of yarn brakes, each brake corresponding to a respective weft yarn supply bobbin, and means for actuating a selective one of said brakes to release said one brake from a weft yarn at the start of a weft picking operation; and an adjusting means for adjusting the on-set of braking reengagement of said one brake on the weft yarn at the end of the weft picking operation to vary the length of time said one brake is released.

14. A method of braking weft yarns in a multiple weft weaving machine comprising the steps of

positioning each of a plurality of weft yarns from a plurality of weft yarn supply bobbins within a respective weft yarn brake of a plurality of brakes, each brake having an off-position for relasing a weft yarn and an on-position for engaging a weft yarn during a picking operation;

selectively releasing each of the brakes into a respective off-position in a sequential manner to release a respective yarn; and

adjusting the onset of the on-position of each brake relative to the other brakes to initiate braking of a respective yarn during a picking operation at a time different from the other yarns.

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