Nov. 30, 1954 J. FISHER 2,695,635

PICK AND PICK MECHANISM

Filed May 11, 1953 4 Sheets-Sheet 1

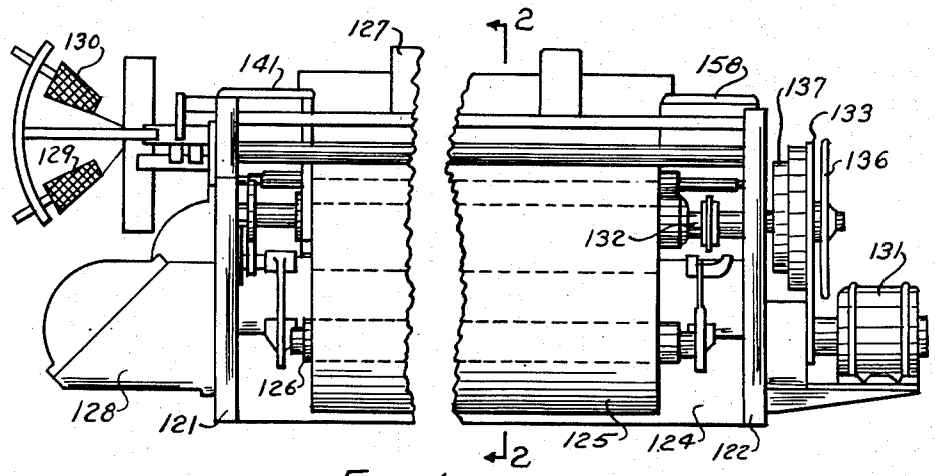


FIG. 1

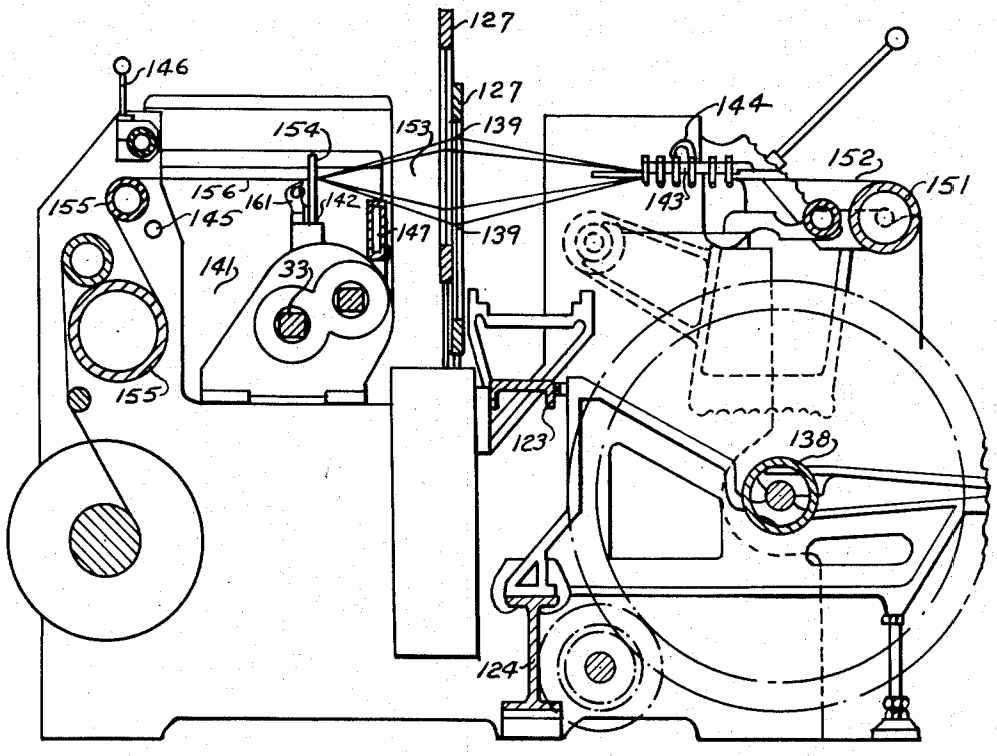


FIG. 2

INVENTOR.
JOHN FISHER
BY
RICHEY, WATTS, EDGERTON & McNENNY
Frederic B. Scherman
ATTORNEYS

Nov. 30, 1954 J. FISHER 2,695,635

PICK AND PICK MECHANISM

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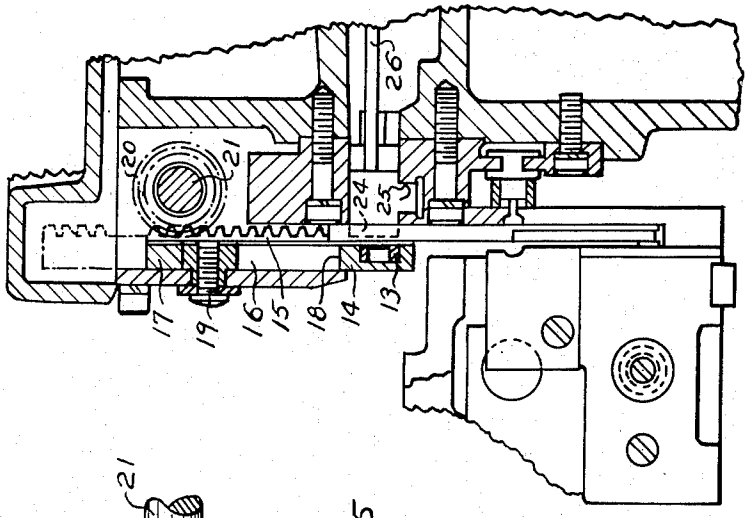


FIG. 4

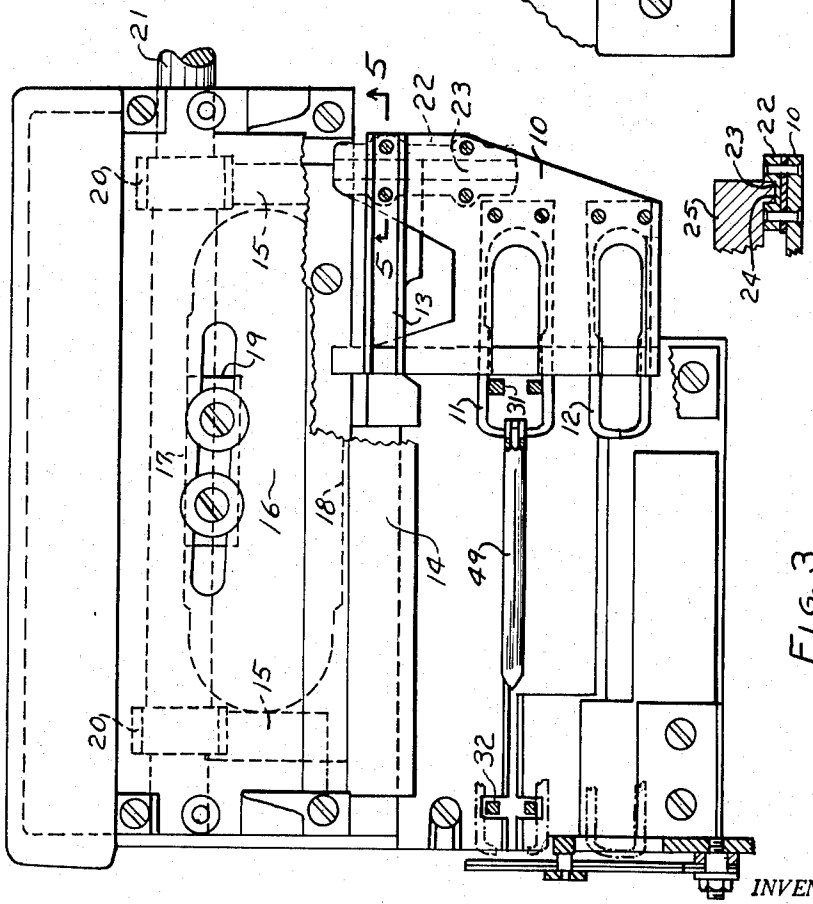


FIG. 5

FIG. 3

INVENTOR.
JOHN FISHER
BY
RICHEY, WATTS, EDGERTON & McSHENNY
Fredric B. Schramm
ATTORNEYS

Nov. 30, 1954 J. FISHER 2,695,635

PICK AND PICK MECHANISM

Filed May 11, 1953 4 Sheets-Sheet 3

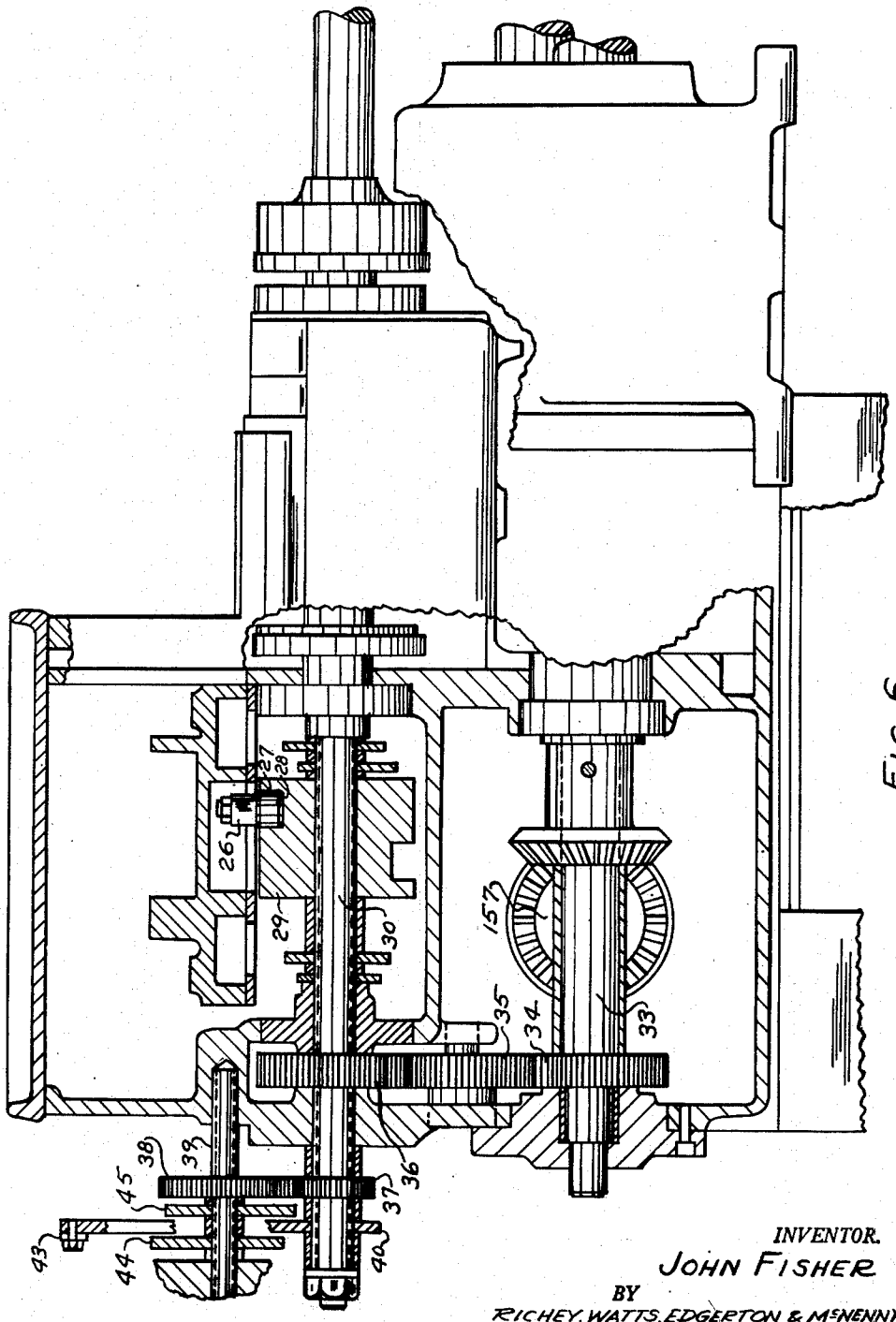


FIG. 6

INVENTOR.
JOHN FISHER
BY
RICHEY, WATTS, EDGERTON & McNENNY
ATTORNEYS

Nov. 30, 1954 J. FISHER 2,695,635

PICK AND PICK MECHANISM

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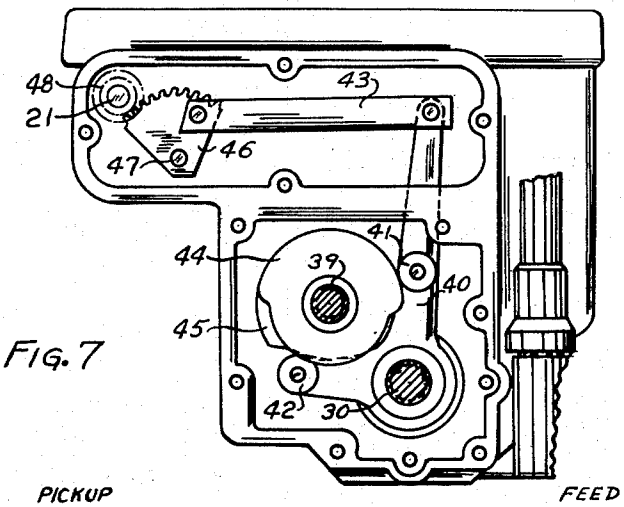


FIG. 7

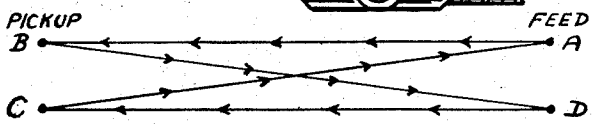


FIG. 8

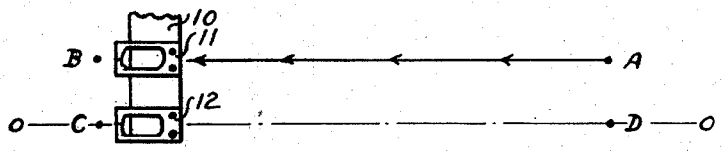


FIG. 9

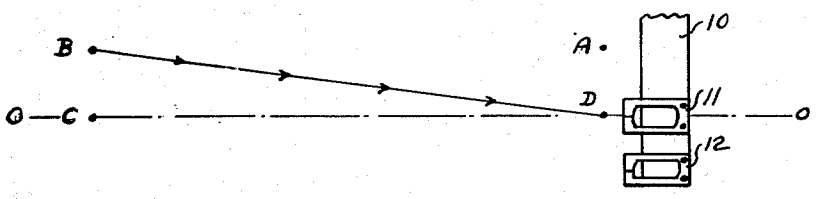


FIG. 10

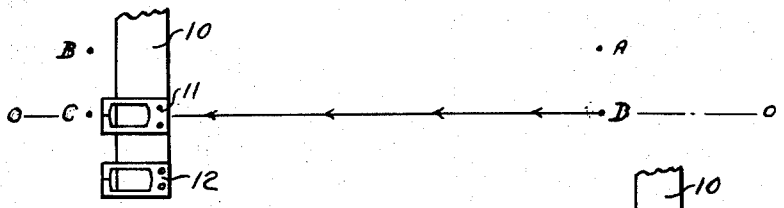


FIG. 11

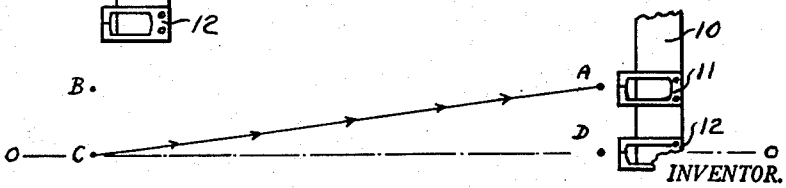


FIG. 12

INVENTOR.
JOHN FISHER

BY
RICHEY, WATTS, EDGERTON & McNENNY
Fredric B. Schramm
ATTORNEYS

United States Patent Office 2,695,635 Patented Nov. 30, 1954

2,695,635

PICK AND PICK MECHANISM

John Fisher, Cleveland, Ohio, assignor to The Warner & Swasey Company, Cleveland, Ohio, a corporation of Ohio

Application May 11, 1953, Serial No. 354,025

9 Claims. (Cl. 139—126)

This invention relates to weaving, especially high speed weaving and has for its principal object enabling perfect cloth to be woven.

An object of the invention is to draw weft thread alternately from different packages in order to overcome the effect of changes in weight or color of different portions of the weft thread in a single package.

Whenever a single source of yarn or weft thread is used in a weaving machine any variation in the yarn tends to appear as a bar or a definite area in the finished cloth with the result that the cloth is imperfect and must be rated as second quality. When the variations in yarn consist of differences in diameter of the yarn throughout the yarn package, a smaller than normal diameter will result in a loose weave cloth while a larger than normal diameter will result in a tight weave cloth. There may be a variation as a result of a flaw in the preparation of the yarn such as a difference in the amount of twist in the yarn or the use of a different type of oil during some stage of the yarn preparation. Such differences in quality of the yarn tend in themselves to produce variations in appearance of the cloth. Moreover this type of difference varies the rate of absorption of dye by the yarn and results in different shades of dye color in the same yarn package.

It is accordingly an object of the invention to overcome the effects of various kinds of yarn variation and to alternate the yarn feed from different sources of supply as the weft is laid into the shed of the weaving machine.

A specific object of the invention is to provide an attachment for standard weaving machines of the gripper shuttle type which may be installed for enabling weft thread from two different packages to be fed into the shed alternately without changing the general principle of operation or mechanical functions performed in other parts of the weaving machine.

It is an object to provide such an attachment which will permit standard shuttles with standard weft thread grippers to be employed and which will function with standard mechanism for opening and closing jaws in the weft thread feeders and for opening and closing the weft gripper jaws in the shuttles as the weft thread is presented to a shuttle by the weft thread feeder.

Other and further objects, features and advantages will become apparent as the description proceeds.

In the standard picking mechanism known to those skilled in the art the weft thread is presented to the shuttle by the thread feeder which travels back and forth between stations at which it presents the weft thread to the shuttle and at which it takes a new grip on weft thread from the supply spool or package. As the weft thread feeder presents the weft thread to the shuttle it releases the thread and shuttle jaws are closed to grip the thread. Thereafter the shuttle is fired or "picked" and the weft feeder moves forward and regrips the thread while it is being cut. When the weft feeder has gripped the thread, it is returned to its initial position. This action is well known to those skilled in the art being described and explained for example in Pfarrwaller Patent #2,578,205.

In carrying out my invention in accordance with a preferred form thereof a longitudinally movable attachment plate is provided carrying a pair of weft feeders mounted side by side on the plate. A laterally movable support for the plate is provided so as to bring one or the other of the weft feeders in the normal line of shuttle movement and cooperating with the shuttle in the normal path of the standard machine. The two feeders, however,

are associated with separate packages so that, when the feeder supporting plate is in one lateral position, weft thread from one package is presented to the shuttle, and when the plate is in the other alternative position weft thread from the other package is presented to the shuttle. Suitable driving mechanism, synchronized with the other movements of the weaving machine, is provided for producing the lateral motion of the weft-feeder-carrying attachment plate. Shuttles are picked in the usual manner, but the shuttles picked alternately carry weft from different packages. Therefore, I refer to my novel mechanism as "pick and pick" mechanism.

A better understanding of the invention will be afforded by the following detailed description considered in conjunction with the accompanying drawings in which

Fig. 1 is a general front view of a weaving machine showing two separate weft thread packages, which may be used alternately (the front of the machine being the cloth-beam location where the operator stands);

Fig. 2 is a cross-section of the apparatus of Fig. 1 represented as cut by plane **2—2**, as viewed from the right;

Fig. 3 is a view of the pick and pick mechanism viewed from the rear of the weaving machine with a guide member broken away in part;

Fig. 4 is a side view of the mechanism of Fig. 3 with certain parts shown in section (as seen from the left-end of the weaving machine of Fig. 1);

Fig. 5 is a view of a section cut by plane **5—5** represented in Fig. 3;

Fig. 6 is a view of the apparatus showing the drive from the main drive shaft to a cam shaft and the drive for the pick and pick mechanism as viewed from the front of the weaving machine;

Fig. 7 is a side view of the drive mechanism which is used for driving the mechanism illustrated in Fig. 3, as viewed from the left end of the weaving machine; and

Figs. 8, 9, 10, 11 and 12 are schematic diagrams illustrating the manner of operation of the pick and pick mechanism.

Referring to the drawings, in the form of apparatus shown by way of illustration, the weaving machine comprises a supporting frame including a pair of side plates **121** and **122** (represented in Fig. 1) secured to cross members **123** and **124**, shown in cross-section in Fig. 2. The weaving machine is of the gripper shuttle type as illustrated. In Fig. 1 there is visible a roll of cloth **125** which has been wound on the cloth beam **126**. There are heddle frames **127** carrying heddles for the weaving machine. Shedding mechanism is enclosed within the housing **128** shown at the left in Fig. 1 and two stationary spools or packages **129** and **130** are provided for the weft yarns. The machine may be provided with shuttle picking, guiding and conveying mechanism of the general type illustrated in Patents Numbers 2,160,338, 2,160,339, 2,136,703, 2,420,380 to Moessinger and 2,099,627 to Rossman, and Patent 2,514,152 to Darash.

In the apparatus represented in Fig. 1 there is an electric motor **131** for providing the driving power, which is adapted to drive the main shaft **33** through a suitable drive, such as a belt or chain drive **133**. A hand wheel **136** may also be provided for the main drive shaft **33**. In order to facilitate rapid stoppage of operating parts of the weaving machine in case of thread failure or failure of some operative part of the weaving machine, an automatically operating clutch and brake mechanism is also provided which is concealed within the drum **137**, represented in Fig. 1.

Referring to Fig. 2, the weaving machine includes a warp beam **138**, the heddle frames **127** carrying heddle eyes **139**, a picker box **141** including lay mechanism **142**, and the cloth beam **126**. There is a conventional supporting bar **143** carrying a plurality of drop wires **144** for an electrical stop mechanism responsive to failure of warp yarn, to stop shaft **145** represented in cross-section in Fig. 2 adapted to be actuated by any one of numerous stop motions, not visible in Fig. 2, including certain conventional stop mechanism, not described herein, and a manual control handle **146** for starting and stopping the weaving machine. There is a pivoted support for a whip roll **151**.

During the operation of the weaving machine the warp

yarns or threads **152** are drawn from the warp beam **138** over the whip roll **151** through the drop wires **144** and formed into a shed **153** by the operation of the heddles **127** controlled by the shedding mechanism **128**. They are then drawn through the dents of a reed **154** carried by the lay mechanism **142** along conventional rolls **155** to the cloth beam **126** in the form of cloth **156**. As in conventional gripper-shuttle weaving machines, the weft threads, thrown through the shed **153** to a receiving box **158** by the mechanism in the picker box **141** driven by a picker shaft **157** (see Fig. 6) geared to the main shaft **33**, are beated in by the reed **154** to form the cloth **156**. Shuttle guides **161** guide the shuttles through the shed **153**. In order to avoid weaving defective cloth in the event of warp breakage, weft failure, or other faulty operation and in order to guard against the weaving of numerous picks of cloth after such a defect has occurred as a result of the high speed of operation of the automatic weaving machine shown a suitable mechanism associated with the stop shaft **145** is provided for stopping the weaving machine as soon as a warp thread failure, weft fault, or some other failure takes place.

For returning the shuttles to the picker box after they have reached the receiving box, a conventional shuttle conveyor **147** is provided.

Within the picker box **141** there is conventional mechanism for elevating each shuttle in succession from the return conveyor to a position at which weft thread is presented to the shuttle. In the conventional mechanism there is a single weft thread feeder with jaws for holding the weft thread, and the shuttles likewise have jaws for holding the weft thread. Jaw-openers suitably synchronized with the shuttle conveyor, picking and beat-up operations, act to release the shuttle jaws to close them as the feeder jaws are opened. The operation of such mechanism is described in the aforesaid Pfarrwaller Patent No. 2,578,205.

In utilizing my pick and pick mechanism the same shuttle elevating, opening and closing, and feeder jaw opening and closing mechanisms are employed. However, in place of a plate having only horizontal movement for carrying a single weft thread feeder, I employ the apparatus illustrated in Fig. 3 including a depending plate or arm **10** supporting a pair of weft-thread feeders **11** and **12**. As will appear, the plate **10** is movable both horizontally and vertically. Conventional means are employed for producing the horizontal motion; novel means constituting a part of my invention produce the vertical motion. As shown, the weft feeders **11** and **12** are of conventional form, each consisting of a pair of spring jaws normally springing together to hold the end of a supply of weft thread, one from the package **129**, the other from the package **130** (Fig. 1).

Mechanism is provided for causing the weft-feeder arm **10** to follow a path illustrated in Fig. 8, with forward motion horizontally and return motion diagonally toward upper and lower positions alternately. This is done in order that one feeder **11** or the other **12**, will follow the line O—O of shuttle travel, for first feeding the shuttle and then regripping the end of the weft thread.

For enabling the plate **10** to execute the motion described, there is a guide channel **13** secured to the plate **10** and a guide-way **14** is provided, in which the channel **13** may slide, as illustrated in Figs. 3 and 4. For vertically moving the members **13** and **14**, two racks **15** are secured to the guide-way **14** near the ends thereof. The central portion **16** of the guide-way member **14** is cut away to form upper and lower edges **17** and **18**. An adjustable stop block **19** is provided, which is adapted to cooperate with the edges **17** and **18** for limiting the travel of the racks **15**.

Gears **20**, carried by a shaft **21**, and meshing with the racks **15** are provided. As will be described more in detail hereinafter, means are provided for oscillating the shaft **21** to raise and lower the weft thread feeders **11** and **12**.

In order that horizontal oscillation of the weft feeders **11** and **12** may be produced independently of the vertical movement, a guide-way plate **22** is secured to the plate **10**, having a vertical groove **23** as illustrated in Fig. 5. Horizontally moving drive mechanism is provided including a nose **24** formed in an enlarged end **25** of a lever arm **26**. The nose **24** cooperates with the vertical groove **23**. A cam follower **27** is carried at the opposite end of the lever arm **26** (Fig. 6) for cooperation with a cam groove **28** in a barrel cam **29** mounted on a cam shaft **30**.

Conventional feeder jaw openers **31** and **32** are provided, which are secured to transversely, horizontally moving mechanism, not shown, which operates in the same manner as in conventional weaving machines.

For driving the cam shaft **30** from the main drive shaft **33**, gearing is provided, comprising a gear **34** keyed to the drive shaft **33**, a gear **35** meshing with the gear **34**, and a gear **36** keyed to the cam shaft **30** and meshing the gear **35**.

For producing oscillation of the shaft **21** carrying the rack-operating gear **20**, another cam mechanism driven by the cam shaft **30** is provided. There is a gear **37** keyed to the cam shaft **30** meshing with a gear **38**, carried by a stub shaft **39**. There is a lever arm **40** freely pivotal upon the shaft **30**.

The lever arm **40** carries a cam follower **41** and has a transverse arm carrying a second cam follower **42**. The cam followers **41** and **42** are on opposite sides of the arm **40**. For positively driving the lever arm **40** through the cam followers **41** and **42**, two cams **44** and **45** are secured to the stub shaft **39**, on either side of the arm **40**. A link **43** is pivotally secured at one end to the upper end of the lever arm **40** and at the other end to a gear segment **46**, which is pivoted on a pin **47** and meshes with a gear **48**, keyed to the shaft **21**.

During the operation of the weaving machine a single pick of a shuttle takes place for each rotation of the main drive shaft **33**. This action takes place through mechanism, not separately illustrated, within the picker box **141** (Fig. 2). Likewise for each rotation of the main drive shaft **33** a single beat-up motion takes place through the action of the reed **154** and the shedding mechanism produces an operation of the heddle frames **127** to produce a new shed **153** once for each rotation of the main drive shaft **33**.

The gear ratio between the main drive shaft **33** and the cam shaft **30** is such that the cam shaft also makes a single rotation for each of the operations just described. This causes the oscillating lever arm **26** to produce motion back and forth horizontally of the guideway **23** once for each rotation of the main drive shaft **33** in order that weft thread may be fed to a shuttle each time the shuttle is to be picked.

As illustrated, the gear ratio between the cam shaft **30** and the stub shaft **39** is 1 to 2, however, so that two rotations of the cam shaft **30** are required for each rotation of the cams **44** and **45**. Consequently, for each rotation of the main drive shaft **33** the link **43** is driven in one direction only, being driven forward for one pick and back for the next pick, and so on alternately. As shown in Fig. 7 the cam shape is such that for nearly one-half rotation of the cams **44** and **45**, the cam followers remain stationary and through a small angle the cam follower drops or rises and then remains stationary again. Since the shaft **39** makes one revolution for two revolutions of the main drive shaft, the guideway **14** is lowered after one pick and raised after the next pick, the operation thus alternating indefinitely. The arm **10** carrying the two weft feeders **11** and **12** is therefore subject to the action of both the barrel cam **29** and the flat cams **44** and **45**. The cam **29** operating at twice the speed of the cams **44** and **45**.

Referring to Fig. 8, the arm **10** is moved horizontally along the line AB by the action of barrel cam **29** while the constant radius of the portion of the cams **44** or **45** is effective. Then on the return stroke while both sets of cams are effective, the arm **10** follows the diagonal path BD. On the next forward stroke the arm **10** is caused to follow the path DC; whereas on the return stroke the action of the cams **44** and **45** causes the arm **10** to be lifted simultaneously with the horizontal motion so as to follow the diagonal path CA.

Referring to Fig. 9 since the path of shuttle travel is along the line OO, when the arm **10** is in its upper position the lower feeder **12** is in the position to present thread to a shuttle **49**. Accordingly at the point D the thread feeder presents the thread to the shuttle. As in the conventional mechanism, at this point the feeder-jaw-opener prongs **31** (Fig. 3) are inserted to release the thread from the feeder **12** as the shuttle jaw opener (not shown) is released to permit the shuttle jaws to grip the thread. Thereupon the shuttle is picked by the picking mechanism **141** which projects the shuttle through the shed **153**.

Thereafter the thread feeder **12** moves from the point D to the point C as illustrated in Fig. 9. At this position the feeder-jaw-opener **32** (Fig. 3) is released by conventional mechanism (not shown) for gripping the weft thread an instant before the portion of the thread beat into the shed has been cut off by mechanism not here shown.

As the arm **10** moves from the point B to the point D the weft thread feeder **12** is moved out of the shuttle action line OO and the weft thread feeder **11** is moved into the shuttle action line OO as shown in Fig. 10. This time the thread feeder **11** presents its thread to the next shuttle which has been brought into position by mechanism, not shown, and that shuttle is fired. Thereupon the thread feeder **11** travels from point D to point C to pick up the thread as in the previous case (see Fig. 11). However, since the feeder **11** holds weft thread from the package **129** and the feeder **12** holds weft thread from the package **130** weft threads from different packages have been fed in succession. On the return stroke the arm moves from the point C to the point A and the weft feeder **11** is removed from the shuttle action line OO. Accordingly, the weft thread feeder **12** is again placed in its original position in the shuttle action line OO as illustrated in Fig. 12, and the cycle is repeated. The cycles continue indefinitely with weft thread from the packages **129** and **130** being beat into the shed alternately.

In each case the weft-thread feeder **11** or **12** is in the same position in which the single weft thread feeder of conventional machines would be for both the shuttle picking and the weft thread pick up positions so that the standard feeder opener and closer mechanisms **31** and **32** in their normal operating position may be employed and no change in the standard equipment is required in this respect. Likewise, whichever shuttle is to be picked is in the same position when the weft thread is presented to it as in the conventional apparatus so that the standard shuttle opening and closing mechanism for controlling the thread gripping jaws of the shuttle may be employed as in the conventional apparatus.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

What is claimed is:

1. Pick and pick mechanism comprising in combination with the cam shaft of a gripper-shuttle type weaving machine, a cam thereon, a pair of weft thread feeders, a movable supporting plate therefore carrying the feeders one above the other, a vertically moving horizontally extending guide-way, a guide channel secured to the feeder support cooperating with the vertically movable guideway, a horizontally movable vertical guide-way secured to the feeder support, a nose engaging said latter guideway, an oscillating lever secured to said nose at one end and carrying a cam follower at the other end, energizing said cam for producing horizontal motion of the feeder support, a stub shaft with reduction gearing between the cam shaft and the stub shaft for reducing the stub shaft speed to ½ of the cam shaft speed, and linkage between the stub shaft and the vertically moving guideway for raising or lowering the vertically moving guideway once for each two revolutions of the cam shaft whereby the weft feeders are alternately raised or lowered to the shuttle action line for presenting one weft thread or the other to a shuttle preparatory to picking.

2. In a weaving machine of the gripper shuttle type having mechanism for conveying shuttles to picking position in a line of shuttle motion and successively picking the shuttles in the same direction, a pair of weft feeders mounted side by side and transversely movable, each associated with a different weft thread supply, and mechanism synchronous with the picking mechanism for alternately moving the feeders into the line of shuttle motion for presenting weft thread to the shuttle.

3. In a weaving machine of the gripper shuttle type having mechanism for conveying shuttles to picking position in a line of shuttle motion and successively picking the shuttles, a pair of weft feeders, each associated with a different weft thread supply, mechanism synchronous with the picking mechanism for alternately moving the feeders into the line of shuttle motion for presenting weft thread to the shuttle, a weft feeder support for the two weft feeders carrying the weft feeders side by side, the feeder moving mechanism being arranged to move the feeders transversely back and forth so that first one feeder and then the other is in the line of shuttle motion.

4. Apparatus as in claim 3 in which mechanism is provided for moving the feeders parallel to the line of shuttle motion between a feeding position and a weft thread pick-up position.

5. Apparatus as in claim 4 wherein the shuttle-support moving mechanism is provided with linkage for moving the support back and forth in a direction parallel to the shuttle line of motion twice for each movement back and forth transverse thereto.

6. Apparatus as in claim 5 wherein the linkage for moving the feeder support transversely to the line of shuttle motion includes cams with flat and sloping surfaces for causing the feeder supports to move forward from the weft feed to the pick up position in a straight line parallel to the line of shuttle motion and to recede along a diagonal line including a transverse component of motion.

7. In a weaving machine of the gripper shuttle type in which the shuttles are projected along a pre-determined line of shuttle motion, in combination with a drive shaft, a pair of weft feeders, a weft feeder support to which the weft feeders are secured side by side, mechanical linkage interposed between the drive shaft and the weft feeder support for translating rotation of the drive shaft to oscillation of the feeder support parallel to the line of shuttle motion, and supplemental linkage between the drive shaft and the weft feeder support for translating the rotation of the drive shaft into oscillation transverse to the line of motion of the shuttles whereby the weft feeders are enabled to present weft thread to the shuttles alternately, each weft feeder being associated with a different weft supply.

8. In a weaving machine of the gripper shuttle type in which shuttles are projected in succession along a predetermined line of shuttle motion, in combination with a drive shaft, a feeder supporting plate, a pair of feeders mounted side by side on said plate, a guide-way secured to said plate extending transversely to the line of shuttle motion, a guide channel secured to said plate extending parallel to the line of shuttle motion, a guide-way movable transversely to the line of shuttle motion adapted to cooperate with said guide channel, linkage interposed between said drive shaft and said latter guide-way translating rotation of the drive shaft into transverse oscillation of the guide-way, a nose movable parallel to the line of shuttle motion engaging the first mentioned transversely extending guide-way, and linkage interposed between the drive shaft and said nose for translating the rotation of the drive shaft into oscillatory motion of the nose.

9. Apparatus as in claim 8 wherein reduction gearing is interposed in the first mentioned linkage for causing transverse oscillations of the feeder support to take place half as frequently as longitudinal oscillations thereof.

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