Jan. 23, 1951 E. PFARRWALLER 2,538,798

RECEIVING AND RETURN MECHANISM FOR SPOOLLESS SHUTTLES IN LOOMS FOR WEAVING

Filed Aug. 19, 1948 4 Sheets-Sheet 1

Fig. 4.

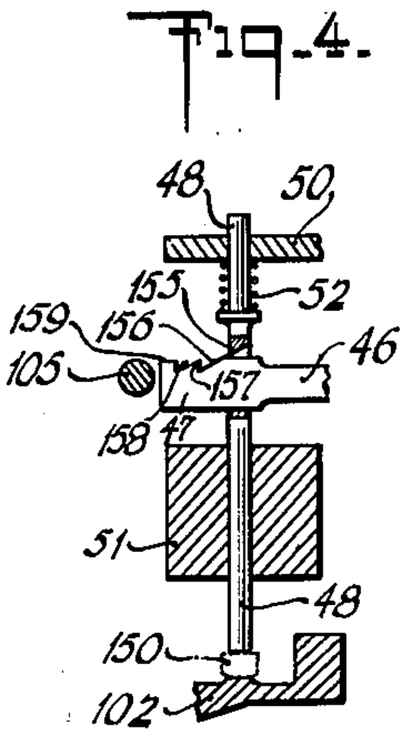


Fig. 3.

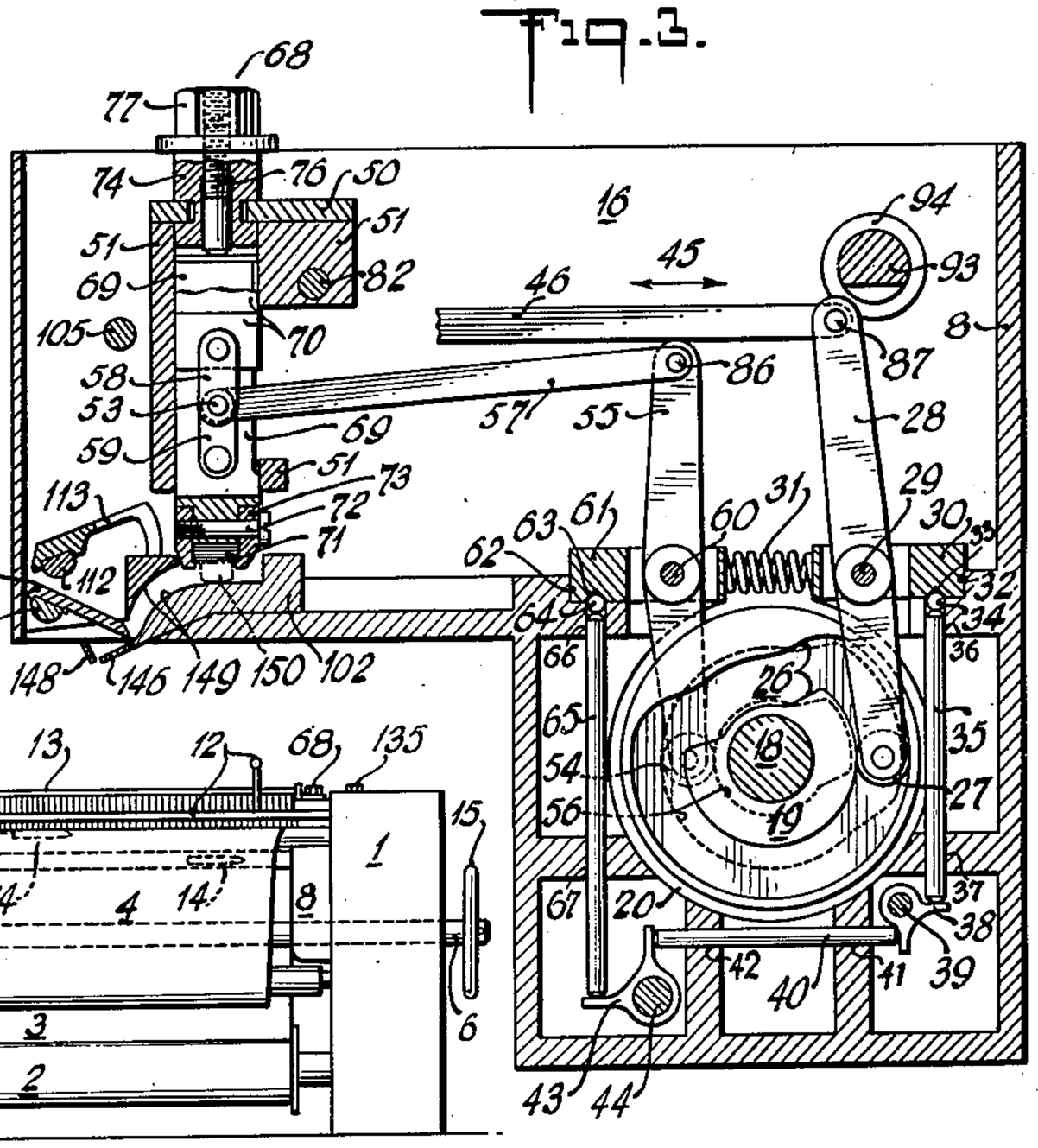


Fig. 1.

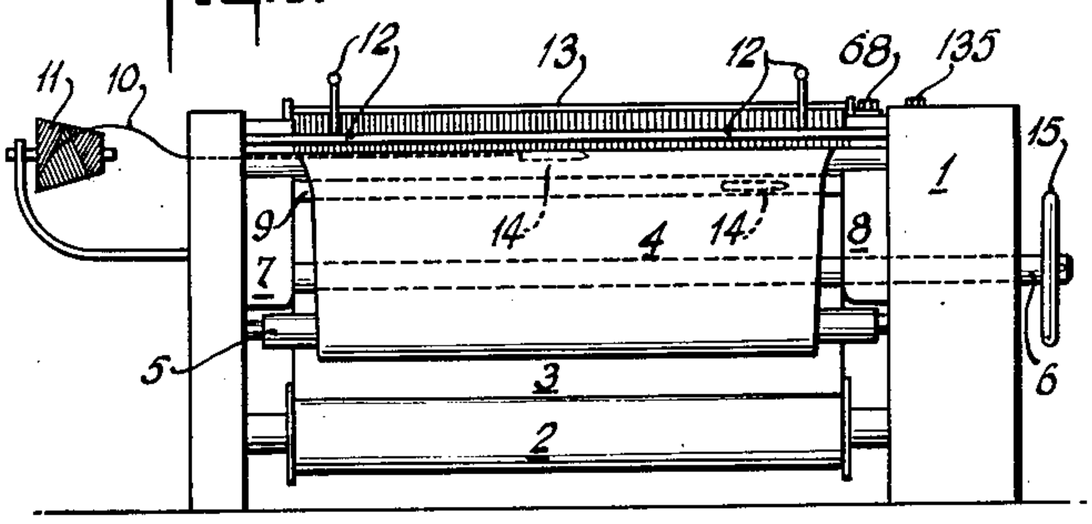
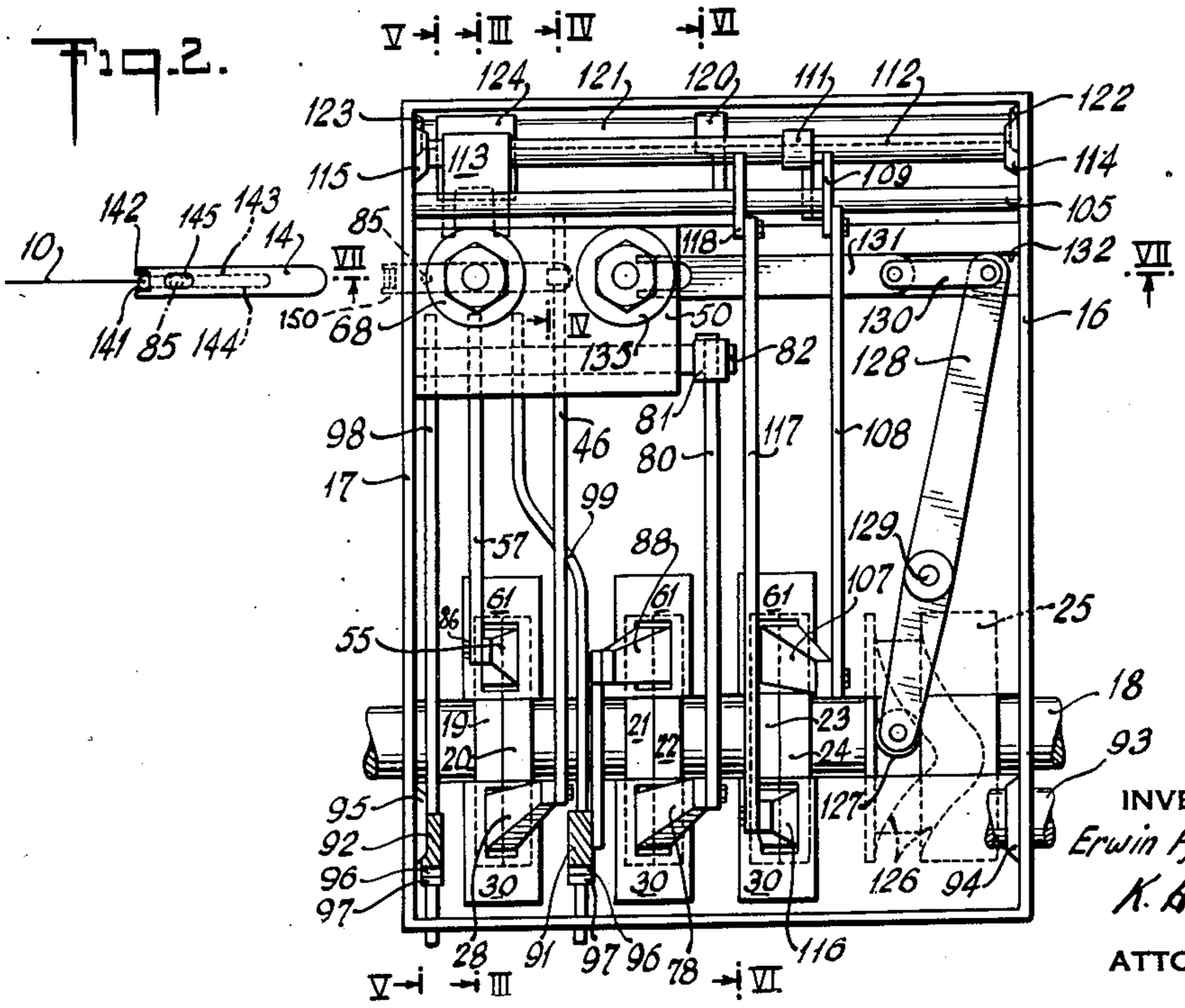


Fig. 2.



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RECEIVING AND RETURN MECHANISM FOR SPOOLLESS SHUTTLES IN LOOMS FOR WEAVING

Filed Aug. 19, 1948 4 Sheets-Sheet 2

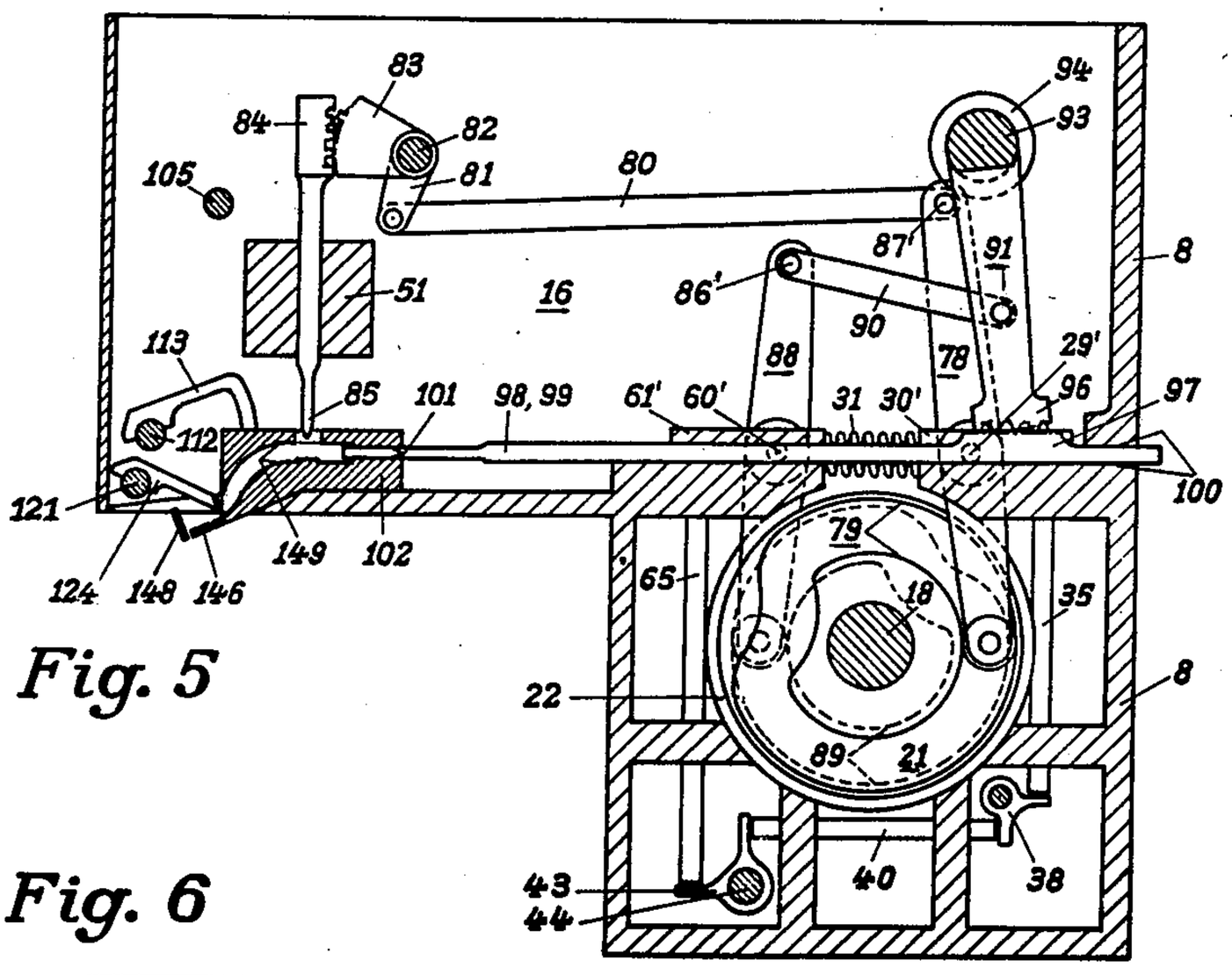
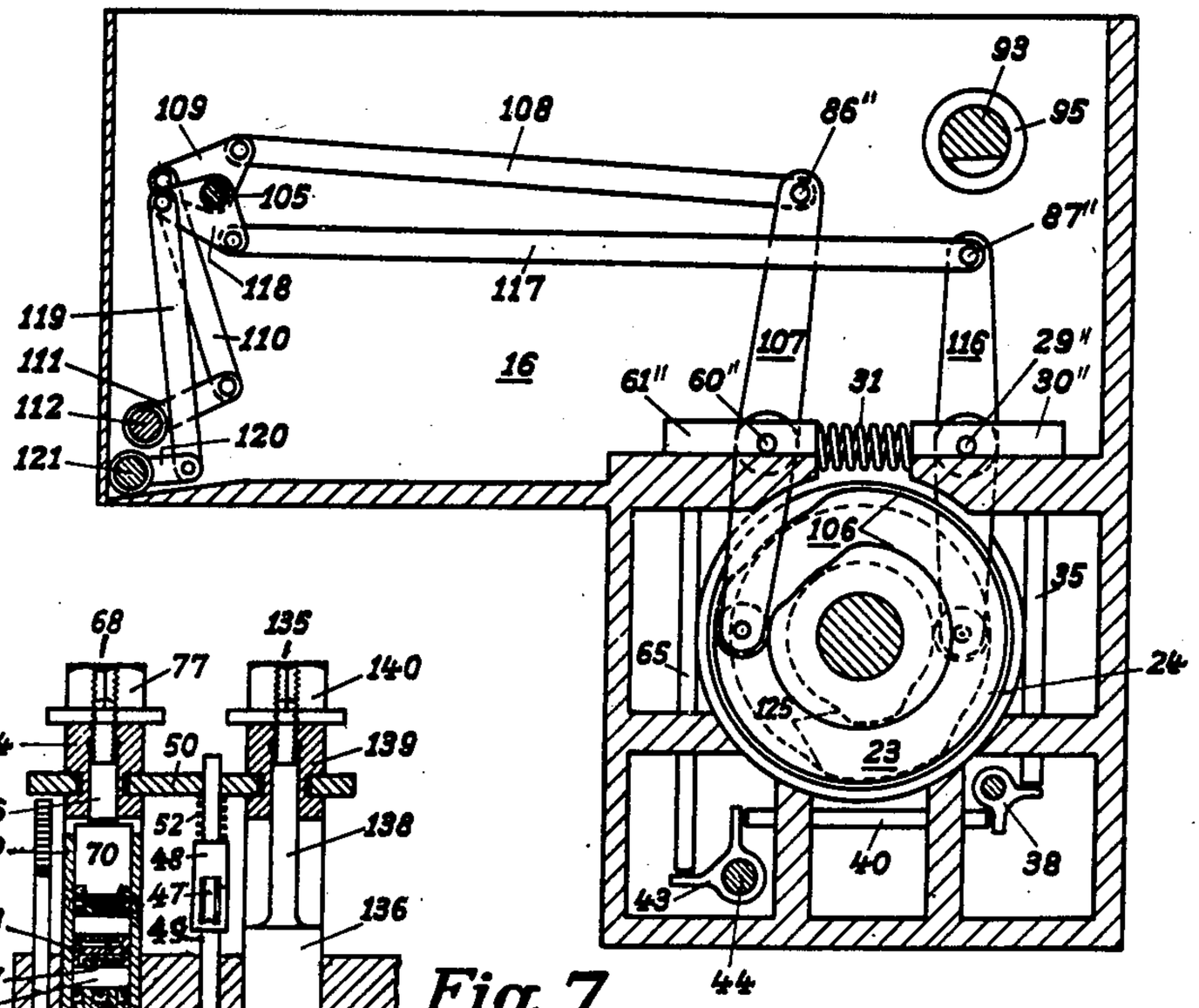


Fig. 5

Fig. 6



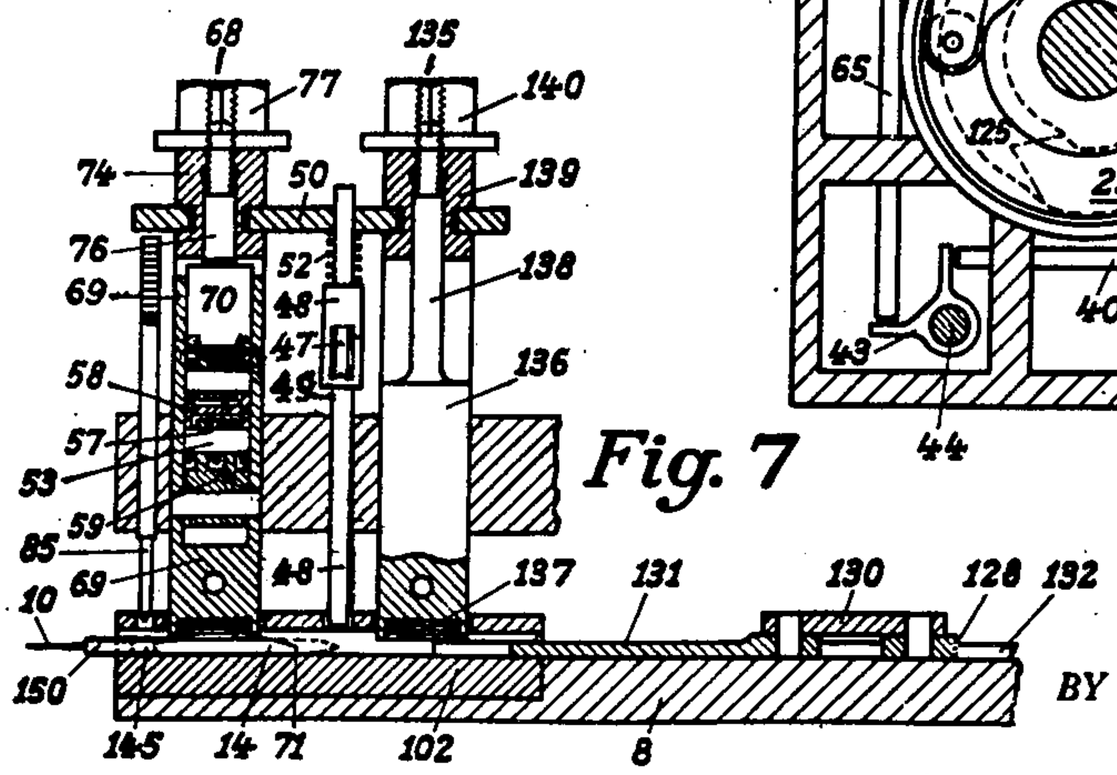


Fig. 7

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RECEIVING AND RETURN MECHANISM FOR SPOOLLESS SHUTTLES IN LOOMS FOR WEAVING

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Fig. 9

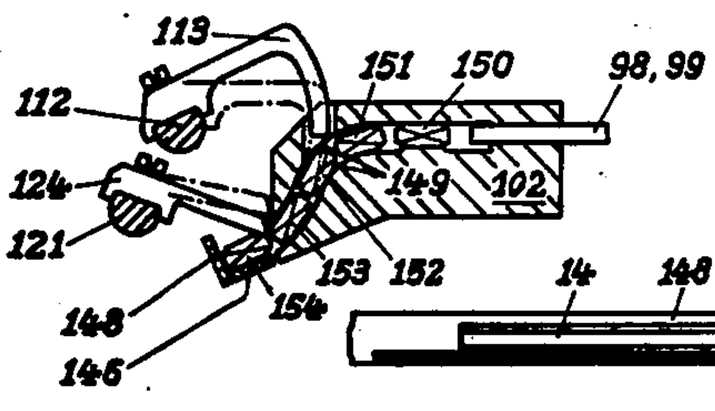


Fig. 8

Fig. 10

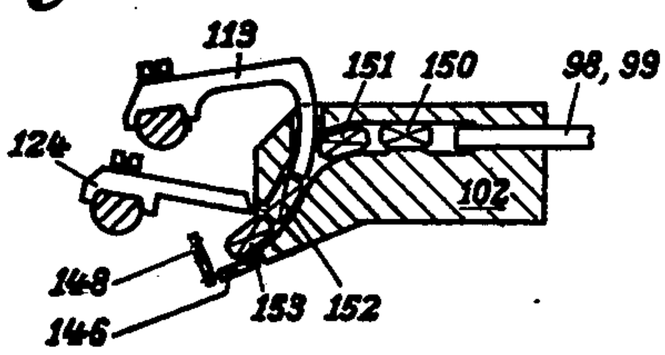


Fig. 11

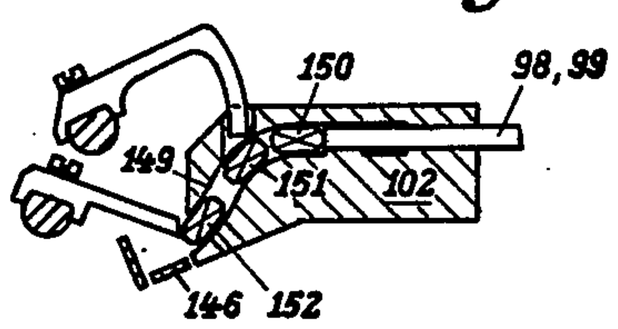


Fig. 12

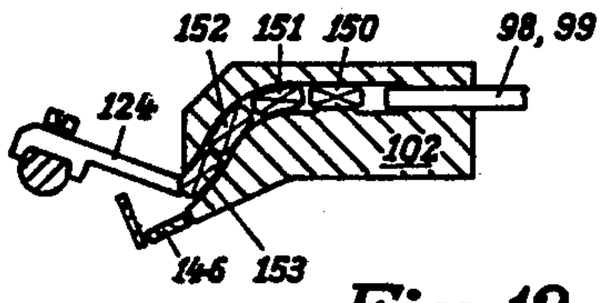


Fig. 13

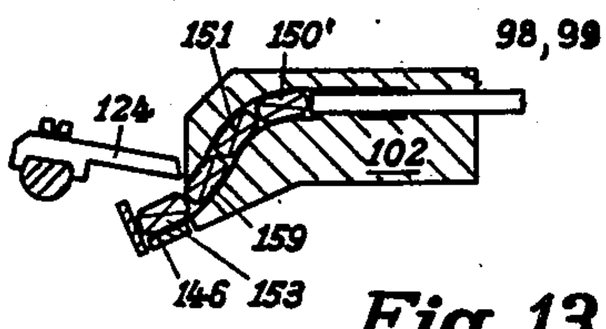


Fig. 14

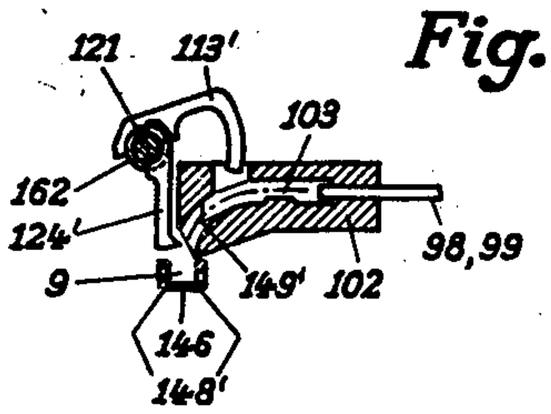


Fig. 15

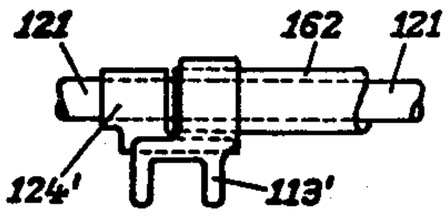


Fig. 16

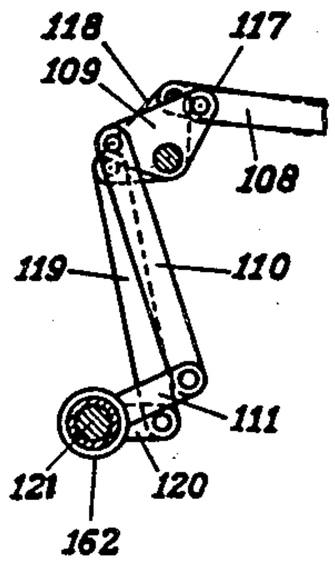
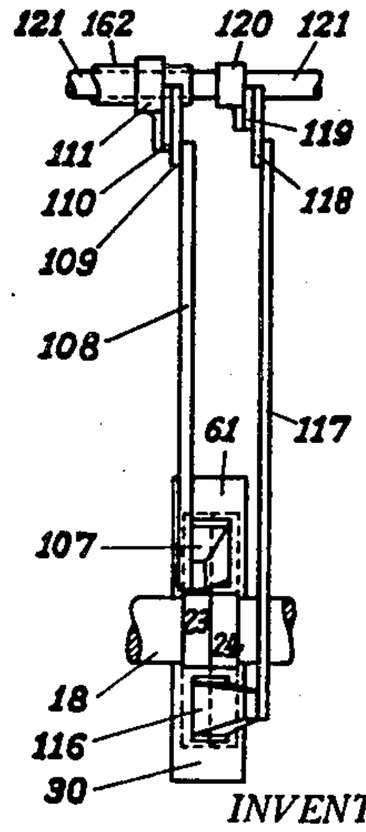


Fig. 17



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RECEIVING AND RETURN MECHANISM FOR SPOOLLESS SHUTTLES IN LOOMS FOR WEAVING

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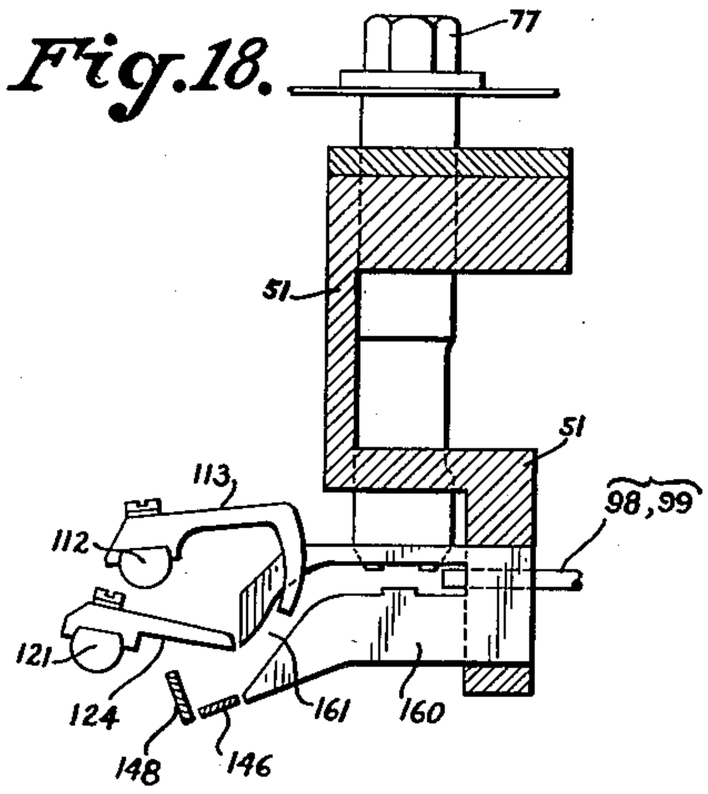
Fig. 18.



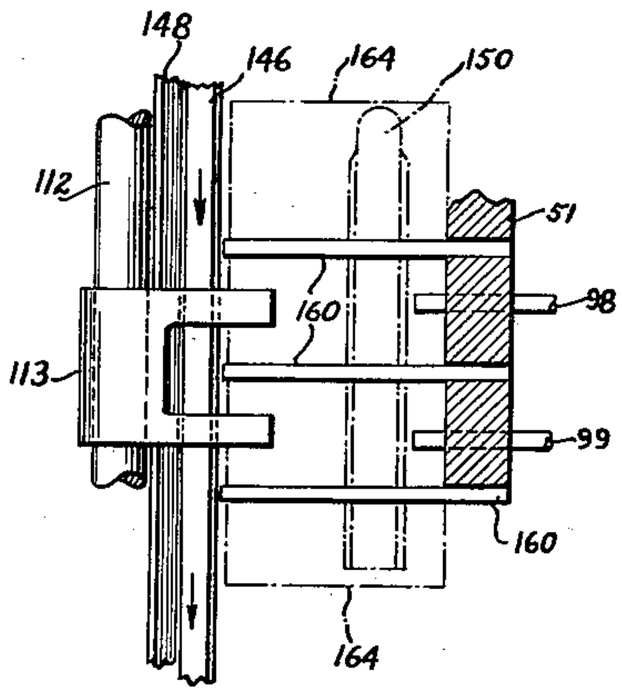
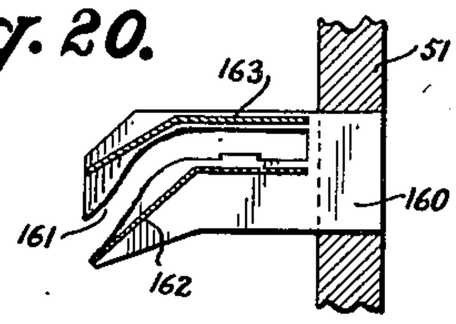


Fig. 19.

Fig. 20.



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Patented Jan. 23, 1951 2,538,798

UNITED STATES PATENT OFFICE

2,538,798

RECEIVING AND RETURN MECHANISM FOR SPOOLLESS SHUTTLES IN LOOMS FOR WEAVING

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Application August 19, 1948, Serial No. 45,178
In Switzerland August 20, 1947

33 Claims. (Cl. 139—125)

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The present invention relates to improvements in looms for weaving of the type having gripper shuttles which do not carry thread spools and which are picked by a picking mechanism through the shed to a shuttle receiving or trap mechanism wherefrom they are returned to the picking side of the loom on a return conveyor, more particularly to a mechanism and means for positively moving the shuttles in and from the shuttle trap to a return conveyor.

An object of the invention is the provision of a mechanism, in looms for weaving of the spoolless shuttle type, for catching and braking the shuttles after they have pulled a weft thread through the shed, for checking whether a shuttle has arrived in the trap at the proper time, for returning the shuttles to a predetermined position within the shuttle trap which position is always the same no matter where the shuttles come to a standstill within the trap, for fixing a shuttle in said position, opening the thread grippers of the shuttle while it is in the aforementioned position, and for pushing the shuttles laterally from said position out of the trap and transferring them to the return conveyor.

A further object of the invention is the provision, in a loom for weaving having spoolless shuttles with weft thread grippers, of a shuttle brake and trap mechanism including means for checking the arrival of the shuttles in the trap, for positioning the shuttles in the trap after they have come to a standstill, for opening the thread grippers of the shuttles, for releasing the weft thread after the shuttles have been positioned in the trap, for removing the shuttles laterally from the trap, and for correctly placing them on the return conveyor whereby operation of the shuttle brakes and of all of the other aforesaid movements is derived from cam means disposed on a common shaft which is rotated by the general loom drive.

Another object of the present invention is the provision, in a loom for weaving, of a brake and trap mechanism for spoolless shuttles after they have inserted a weft thread in the shed including control means individually associated with individual means for actuating the brakes, a shuttle arrival check, a shuttle positioner in the trap, an opener for the gripper on the shuttles holding a weft thread, pusher means for removing, laterally, the shuttles from the trap, shuttle transfer means for transferring the shuttles from the trap to the return conveyor, and shuttle transfer locking and placer means for locking the passage of the shuttles from the trap to the conveyor and placing the shuttles correctly on the latter, said control means being adapted to stop the weaving machine upon an improper condition of any of said actuated means.

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An object of the invention is the provision, in a loom for weaving of the spoolless shuttle type, of a shuttle trap mechanism including shuttle brake means, shuttle arrival check means, shuttle positioning means, opening means for grippers on the shuttles holding a weft thread, transfer means for transferring the shuttles from the trap to a return conveyor, of individual operating means for said means which operating means include individually a cam actuated two arm lever and a connecting rod connecting said lever and one of said means, the fulcrums of said two arm levers being displaceable against a resilient resistance and being displaced by the action of the cams when displacement of said connecting rods is impossible due to an improper operating condition of one of said means.

An object of the present invention is the provision, in a loom for weaving, of a shuttle brake having exchangeable brake elements and means for adjusting the brake pressure.

Another object of the invention is the provision, in a loom for weaving, of a positively actuated shuttle brake having a stationary portion and a brake portion connected by a toggle which is extended when the brake is in position for braking on arriving of a shuttle and which is collapsed for releasing the brake from the shuttle.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings, which by way of illustration show what I now consider to be preferred embodiments of the invention.

In the drawings:

Fig. 1 is a diagrammatic view of the cloth beam side of a loom according to the invention;

Fig. 2 is a top view with parts broken off of the shuttle receiving mechanism according to the invention;

Fig. 3 is a transverse sectional view of the shuttle receiving and braking mechanism as well as of the mechanism for transferring the shuttles therefrom to the shuttle return track;

Fig. 4 is another transverse sectional view of a portion of the mechanism shown in Figs. 2 and 3;

Fig. 5 is a further transverse sectional view of the mechanism illustrated in Figs. 2 and 3 and showing the operation of the shuttle removing means and the shuttle fixing pin;

Fig. 6 is a transverse sectional view of the

mechanism according to Figs. 2 and 3, showing, in particular, the drive of the shuttle push out means and shuttle push out and locking lever;

Fig. 7 is a longitudinal sectional view along the axis of the shuttle picking path, of the mechanisms illustrated in Figs. 2 to 5;

Fig. 8 is a longitudinal view of a portion of the shuttle return conveyor according to the invention;

Figs. 9 to 11 illustrate several phases of operation of the shuttle transfer mechanism according to the invention;

Figs. 12 and 13 illustrate two different phases of operation of a simplified shuttle transfer mechanism;

Fig. 14 is a sectional view along the axis of a modified shuttle transfer track and of shuttle transfer means;

Fig. 15 illustrates a portion of the shuttle push out lever and lock as used in the modification shown in Fig. 14;

Figs. 16 and 17 illustrate the mechanism for operating the means shown in Figs. 14 and 15.

Figs. 18–20 illustrate the transfer means comprising guiding plates or sheets.

Like parts are designated by like numerals in all figures of the drawings.

Referring more particularly to Fig. 1, the loom drive is positioned in casing 1 from where all elements are operated, such as the warp beam 2 with warp 3 and the cloth beam 5 with the fabric 4. The picking mechanism in casing 7 and the shuttle receiving or catch mechanism in casing 8 are driven by the main shaft 6 having a hand wheel 15. In casing 7 the weft thread 10 is connected to shuttle 14, which thread is unwound from weft spool 11, and is picked through the shed to the catch mechanism in casing 8. The shuttle 14 is returned in the return conveyor 9 beneath the warp from the catch mechanism or trap 8 to the picking mechanism. The main drive shaft is connected and disconnected with the loom drive by a mechanism 12 which is not shown as it does not form part of the present invention. The shafts for the heddles are designated by numeral 13.

As seen in Fig. 2 cam discs 19 to 24 and a cam drum 25 are keyed to a secondary shaft 18 which is driven by the main shaft 6.

Roller 27, Fig. 3, disposed at one end of double lever 28 is guided in groove 26 of the cam disc 19. Rod 46 is linked to the other end of the double lever 28 by bolt 87. The double lever 28 swings about pivot 29 which is stationary at normal operation of the weaving machine.

Pivot 29 is positioned in a slide member 30 which is held to abutment 32 by a spring 31.

A ball 34 resting on top of rod 35 protrudes into a recess 33 of the slide member 30. This rod slides in guides 36 and 37 provided in the shuttle catch mechanism box 8 and rests with its bottom end on one arm of angular piece 38 which is rotatable on shaft 39. The ends of shaft 39 are supported by the side walls 16 and 17 of the catch mechanism box 8. The other arm of member 38 is abutted by one end of horizontal rod 40 which is guided in stationary guides 41 and 42 and abutts with its other end an angular member 43. The angular member 43 is firmly connected with control rod 44.

The end 47 of the rod 46, Fig. 4, is guided in eye 49 of shuttle catch check rod 48, Fig. 7. The check rod or feeler 48 is guided by stationary plate 50 and the stationary catch mechanism element 51 and is pressed by spring 52 downwards to the end 47 of the rod 46.

Roller 54, Fig. 3, mounted on one end of two arm lever 55 is guided by groove 56 of cam disc 20. One end of rod 57 is pivoted by pivot 86 to the other end of lever 55 and is pivoted with its other end to centre pivot 53 of a toggle joint 58, 59.

Pivot 60 of lever 55 is mounted to slide member 61 which is held against abutment 62 of the catch box casing 8 by spring 31. A ball 64 lies in recess 63 of the slide member 61 and rests on top of rod 65 which is guided in bearings 66 and 67 of the catch mechanism frame. The lower end of rod 65 rests on the angular member 43.

The toggle joint 58, 59 forms part of the shuttle brake assembly 68, Figs. 3 and 7, and connects brake element 69 with a threaded member 70. Exchangeable brake plates 71 are held between brake plate holders 73 which are bolted to brake element 69 by bolt 72. These brake plates may consist of metal, oil-proof rubber or a synthetic or natural material which is suitable as brake material. Member 70 is screwed with its threaded trunk 76 in nut member 74 which is rotatable in plate 50 and whose top end 77 has the configuration of a conventional nut.

A roller at one end of two arm lever 78, Fig. 5, engages groove 79 of cam disc 21. The fulcrum 29′ of lever 78 is supported by a slide member 30′ in the same way as is lever 28 by member 30, Fig. 3. Shaft 82, Fig. 2, is rotatably supported by frame portion 51 and has an arm 81 attached to it which is pivoted to rod 80. Rotation of shaft 82 causes cog wheel segment 83 to move catch pin 85 which is slidable in frame portion 51, up or down by actuating a rack 84 at the upper part of pin 35, Figs. 5 and 7.

The lower end of two arm lever 88 is oscillated by engagement of groove 89 in cam disc 22. Pivot 60′ of lever 88 is supported by slide member 61′ similarly to the support of lever 55, Fig. 3. One end of rod 90 is articulated by a bolt 86′ to the upper end of lever 88; its other end is pivoted to lever 91, Fig. 5, which swings with shaft 93. This shaft is supported in bearings 94, 95 provided on the side walls 16, 17 of the catch mechanism box 8, Fig. 2. There is another lever 92, similar to 91, connected with shaft 93. The lower ends of levers 91 and 92 are constructed as cog-wheel segments 96 which engage individually a rack 97 provided on the shuttle push out rods 99 and 98, respectively. Rods 98, 99 are slidable in guide 100 of the shuttle receiving mechanism casing 8 and guide 101 of the shuttle catch body 102.

There is a further cam disc 23, Fig. 6, whose groove 106 controls movement of the lower end of two arm lever 107 to the upper end of which a rod 108 is pivoted. The left end of this rod is pivoted to bell crank lever 109 mounted on shaft 105. Link 110 connects lever 109 with arm 111 on shaft 112 which is held in bearings 114 and 115, Fig. 2, of the side walls 16 and 17 of the receiving mechanism casing 8. A shuttle push out lever 113 is fixed to shaft 112, Figs. 2 and 3. The slide member support 61″ of pivot 60″ of lever 107 is constructed as the previously described slide members 61 and 61′.

Two arm lever 116 is actuated by groove 125 in cam disc 24. A slide member 30″ supporting pivot 29″ of lever 116 is constructed as are slide members 30 and 30′. The movement of lever 116 is transmitted through a rod 117, a bell crank lever 118, which is rotatable on shaft 105, link 119 and arm 120 to shaft 121 which is supported

in bearings 122 and 123 on the side walls 16 and 17 of the catch mechanism box 8. A shuttle push out lock bar 124 is firmly connected with shaft 121.

Drum 25, Fig. 2, is provided with a groove 126 which accommodates roller 127 of two arm lever 128 which swings about pivot 129. It is linked by member 130 to shuttle return member 131 which it moves reciprocatingly in guide 132, Figs. 2 and 7.

There is a second shuttle catch brake 135, Fig. 7, consisting of a brake element 136 with brake plates 137 and extending upwardly as a threaded bolt 138 which is screwed in threaded bushing 139. This bushing extends rotatably through stationary plate 50 and has a head 140 constructed as a conventional nut.

The shuttles 14 have at their ends a thread gripper having two clip members 141 and 142 the stems 143, 144 of which extend into a longitudinal cavity in the shuttle and can be seen through opening 145 which extends transversely thereto through the whole body of a shuttle, Fig. 2.

Finally, there is a return conveyor 9, Fig. 1, having a conveyor belt 146 provided with noses 147. The return conveyor 9 is laterally inclined and sliding off of the shuttles is prevented by a longitudinal guide rail 148, Figs. 8 and 9 to 13.

The system operates as follows:

The shuttle 14 shot with great velocity through the shed is decelerated by the brakes 68 and 135 and comes to a standstill somewhere in the shuttle trap 102. Thereupon feeler 48 checks whether the shuttle has arrived or not. If no shuttle has arrived, the weaving machine is automatically stopped as will be described later. After arrival of a shuttle in the trap 102 the shuttle push back member 131 pushes the shuttle back to a predetermined position 150. Here, pin 85 is inserted into opening 145, Figs. 2 and 7, of the shuttle and fixes it in position 150. At the same time pin 85 forces the stems of members 141, 142 apart and opens the thread gripper whereby the weft thread is released from the shuttle.

If the shuttle brakes 68, 135 are not properly adjusted it may happen that a shuttle is pushed out of trap 102 by member 131. In this case the feeler 48, coming down once more, does not come to rest on a shuttle and this causes stoppage of the loom, as will be described later. If the shuttle is in its proper position 150, the brake element 69 is lifted and the push out rods 98, 99 push the shuttle into tunnel 149.

The previously arrived shuttles 151, 152 and 153 are already in tunnel 149, Figs. 9, 10 and 11, adjacent one-another. Shuttle 154 is already on conveyor belt 146. After it has been carried away the lock lever 124 is lifted and the push out lever 113 pushes the shuttles 152 and 153 downward until the shuttle 153 has reached the return conveyor belt 146. Thereupon the lock lever 124 comes down and positions the shuttle 153 properly on the return conveyor belt. It holds at the same time the next shuttle 152, Fig. 11, in a position parallel to the return conveyor belt 146 when the shuttle 153 is carried away on belt 146. The transfer or push out rods 98, 99, Fig. 11, push the shuttle from position 150 into the transfer tunnel 149 to position 150' wherefrom it slips by gravity into the position of the shuttle 151. If necessary, the stroke of the transfer rods 98, 99 is increased.

The push out lever 113 may be omitted, as shown in Figs. 12 and 13. In this case the push out rods 98, 99 push the shuttles 150 all the way down when lever 124 is lifted as in Fig. 13. This arrangement may be used in a weaving machine where the width of the fabric is not changed, i. e. in which the distance between the picking mechanism 7 and the shuttle receiving mechanism 8 is permanently fixed.

If the distance between the picking mechanism 7 and the receiving mechanism 8 is changed for producing fabrics of different widths, the arrangement according to Figs. 12 and 13 is sometimes not satisfactory. When changing this distance the timing of the shuttle push out operation must be changed too and it may happen that the movements of the push out rods 98, 99 cannot be brought in agreement with the movement of the return conveyor belt 146. For taking care of this, the movement of the shuttles in the transfer tunnels 149 is supplementarily controlled by lever 113 whereby the timing of the transfer of the shuttle from the discharge end of tunnel 149 to the return conveyor belt can be suitably adjusted. This adjustment can be effected by changing the angular position of cam discs 23 and 24 on shaft 18 which cams actuate the push out lever 113 and lock lever 124.

The braking force of the brakes 68 and 135 can be adjusted by turning the nuts 77 and 140 whereby the brake elements 69 and 136 are moved up or down.

Lifting of the brake element 69 at the moment the shuttle 150 is removed from the trap 102 is effected by collapsing of toggle joint 58, 59 by means of rod 57.

If the brake element 69, when the joint 58, 59 is extended, should strike an incorrectly transferred shuttle 150, the bolt 86 becomes the fulcrum of double lever 55, as its normal pivot 60 can move with slide member 61 against the action of spring 31. Thereby the ball 64 and rod 65 are pressed down and the latter against lever 43 which rotates shaft 44. The latter causes stopping of the weaving machines in conventional manner.

For feeling the shuttle which has arrived in trap 102 rod 46 moves to the right and the nose 155 in the eye of feeler 48 slides down under the influence of spring 52 on the sloped surface 156 of the inner notch on the head 47 of rod 46, Figs. 3 and 4. If there is a shuttle in the trap, rod 46 can continue its reciprocating movement indicated by arrows 45 to the right because feeler 48 rests on the shuttle and nose 155 cannot go deeper than the edge between the notches on the head 47. If there is no shuttle in the trap the feeler rides all the way down on surface 156 till nose 157 of the head 47 abuts nose 155 of the feeler and prevents movement of rod 46 to the right. Then bolt 87 becomes fulcrum of lever 28 and its normal pivot 29 is displaced with the slide member 30 against the action of spring 31 whereby ball 34 presses rod 35 down. This downward movement of rod 35 is transferred via bell crank lever 39 to rod 40 and therefrom to control shaft 44 which causes stopping of the loom by conventional means, or, for example, such as disclosed in my copending application Ser. No. 714,022 of December 4, 1946.

Should a shuttle accidentally be pushed out of trap 102 by the shuttle return member 131, feeler 48 drops into notch 158, because, at that time, rod 46 has moved further to the right. Continuation of movement to the right of rod 46 is thereby prevented and the loom is stopped as described in the paragraph next above.

Should the pin 85 which derives its up and down movement from groove 79 in cam disc 21, hit a shuttle body instead of being inserted into hole 145 of the shuttle, completion of the down stroke of the pin is prevented. This causes bolt 87', Fig. 5, to become temporarily the pivot of two arm lever 78 whereby the loom is stopped in the same way as described in reference to levers 28 or 55.

If the shuttle push out rods 98, 99 cannot complete their push out strokes, bolt 86' becomes temporarily fulcrum of lever 88 and the loom is stopped through displacement of slide member 61'.

If push out lock lever 124 and, or push out lever 113 is prevented to complete its movement the bolts 87'' or 86'' become temporary fulcrums of their levers 116, 107, respectively, and displacement of the slide member 30'' or 61'' causes stoppage of the loom.

In the modification of the shuttle transfer mechanism illustrated in Figs. 14 to 17 the push out lever 113' and the push out lock lever 124' swing about the same axis. In this case the shuttles move on a quarter circle from the picking axis 103 to return conveyor 9 and the shuttles are placed with their small side on the belt 146, which, in this case, is not inclined laterally. Lateral sliding of the shuttles is prevented by lateral guides 148'. Member 124' prevents, as member 124, premature sliding down of the following shuttle in the channel 149' and places the shuttles in correct position on the conveyor before being carried away.

Lever 113' is mounted on a tube 162 and actuated thereby. Shaft 121 is displaced within said tube and actuates lever 124'. Shafts 121 and tube 162 are actuated as illustrated in Fig. 17 and similarly as in the previously described modification.

Instead of the tunnel 149 being shaped out of a full piece the transfer means may comprise two or more plates or sheets 160, Figs. 18–20, distributed over the length of the shuttle 150 and arranged perpendicularly to the axis of the shuttle, provided with slots 161 to guide the shuttles from the receiving mechanism to the conveyor. Such a design has the advantage to be cheaper. If, however, a closed tunnel is necessary covering sheets 162, 163 may be arranged between and beyond the guiding sheets 160. These covering sheets 162, 163 are fixed by copper-soldering, welding or otherwise to the guiding sheets 160 at or near the edges of the slots 161. At its sides the tunnel is closed by a cover 164.

While I believe the above described embodiments of my invention to be preferred embodiments, I wish it to be understood that I do not desire to be limited to the exact details of method, design and construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:

1. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving a plurality of shuttles at the same time through said passage means.

2. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including a closed transfer passage means adapted to hold and pass a plurality of shuttles at the same time.

3. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means, shuttle passage means for passing the shuttles from said brake means to said return conveyor and having a shuttle entry portion extending substantially rectangularly to the direction of movement of the shuttles in said brake means, and shuttle push back means pushing the shuttles, after they have been stopped by said brake means, back to said entry portion.

4. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means having a shuttle entry portion, shuttle fixing means fixing individual shuttles at said entry portion, and shuttle moving means adapted to simultaneously move a plurality of shuttles through said passage means.

5. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means, a shuttle passage means passing the shuttles from said brake means to said return conveyor and having a shuttle entry portion, shuttle push back means pushing the shuttles from where they come to a standstill in said brake means back to adjacent said entry portion, shuttle fixing means fixing individual shuttles at said entry portion, said shuttles having normally closed weft grippers, and said fixing means comprising opener means opening said grippers when they fix a shuttle.

6. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle feeler means contacting and thereby checking the presence of a shuttle in said receiving mechanism, and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving a plurality of shuttles at the same time through said pasage means.

7. In a loom for weaving of the type having spoolless shuttles, loom drive means, shuttle brake means, shuttle passage means passing the shuttles from said brake means to said return conveyor and having a shuttle entry portion, shuttle push back means pushing the shuttles

from where they come to a standstill in said brake means back to adjacent said entry portion, shuttle fixing means fixing individual shuttles at said entry portion, shuttle moving means moving a plurality of shuttles simultaneously through said passage means, and a plurality of cam means connected to and driven by said drive means, said push back means, said fixing means, and said moving means individually comprising mechanisms individually connected with said cam means and being actuated thereby.

8. In a loom as defined in claim 7, an auxiliary shaft connected to and rotated by said drive means, said cam means being fixed on said shaft.

9. In a loom as defined in claim 7, loom stop actuating means, said last mentioned mechanisms individually comprising yielding means yielding upon an improper operating condition of said mechanisms and connected with and actuating said actuating means.

10. In a loom for weaving of the type having spoolless shuttles, loom drive means, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle feeler means contacting and thereby checking the presence of a shuttle in said receiving mechanism, and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving a plurality of shuttles at the same time through said passage means, cam means connected to and operated by said drive means, and a mechanism interconnecting said feeler means and said cam means and comprising locking means locking said mechanism when said feeler means does not contact a shuttle, said mechanism comprising yielding means yielding when said mechanism is locked, and loom stop actuating means connected with said yielding means and being actuated thereby.

11. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising two shuttle brakes and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means extending laterally from one of said brakes, and shuttle moving means individually moving the shuttles from said brake into said passage means.

12. In a loom as specified in claim 11, said brakes individually comprising removable and yielding brake lining means.

13. In a loom as specified in claim 11, said brakes individualy comprising a plurality of removable steel brake plates.

14. In a loom as specified in claim 11, said brakes individually comprising removable brake lining means made of yielding oil proof rubber.

15. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a positively actuated brake, and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including

shuttle transfer tunnel means extending laterally from said brake, and shuttle moving means individually moving the shuttles from said brake into said tunnel means.

16. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means comprising brake applying and releasing means, shuttle passage means for passing the shuttles from said brake means to said return conveyor and having a shuttle entry portion adjacent said brake means, shuttle push back means pushing the shuttles, after they have come to a standstill in said receiving means due to the action of said brake means, back to said entry portion, shuttle moving means moving the shuttles into said entry portion of said passage means, and an actuating mechanism connected with said applying and releasing means and said push back means and releasing said brake means upon actuation of said push back means.

17. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving a plurality of shuttles at the same time through said passage means, said shuttle brake means comprising a reciprocatingly movable brake member, a stationary part, and a toggle joint interconnecting said member and said part, said brake member being applied when said joint is straightened and being released when said joint is collapsed.

18. In a loom for weaving of the type having spoolless shuttles, loom drive means, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means and shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving a plurality of shuttles at the same time through said passage means, said shuttle brake means comprising a reciprocatingly movable brake member, a stationary part, and a toggle joint interconnecting said member and said part, said brake member being applied when said joint is straightened and being released when said joint is collapsed, and an actuating mechanism connected with said toggle joint and comprising cam means connected to and driven by said drive means.

19. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel branching substantially rectangularly from said receiving tunnel and continuing in a downward curve and then in a curve counter to said first curve laterally to said conveyor, and shuttle moving means moving said shuttles sideways

from said receiving tunnel into said transfer tunnel.

20. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel branching from said receiving tunnel and continuing downward in a quarter circle curve to above said conveyor, and shuttle moving means moving said shuttles sideways from said receiving tunnel into said transfer tunnel.

21. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel and downward to said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, and a shuttle push out arm having a free end extending periodically into said transfer tunnel and pushing a shuttle toward said conveyor.

22. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel and having a shuttle discharge portion adjacent said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, and a shuttle positioning and locking lever having a free end swinging periodically between said discharge portion and said conveyor and positioning a shuttle on said conveyor and locking the following shuttles in said transfer tunnel.

23. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel and downward to said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, a shuttle push out arm having a free end extending periodically into said transfer tunnel and pushing a shuttle toward said conveyor, and an actuating mechanism connected to and actuating said moving means and said push out arm and including timing means timing the actuation of said moving means and push out arm so that said push out arm commences to push a shuttle to the conveyor after said moving means has finished moving a shuttle into said transfer tunnel.

24. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism,

said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel and downward to said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, a shuttle push out arm having a free end extending periodically into said transfer tunnel and pushing a shuttle toward said conveyor, and an actuating mechanism connected to and actuating said moving means and said push out arm and including timing means timing the actuation of said moving means and push out arm so that said moving means commences moving a shuttle into the transfer tunnel after the free end of said push out arm has left the transfer tunnel.

25. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel and having a shuttle discharge portion adjacent said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, and a shuttle locking lever having a free end swinging periodically between said discharge portion and said conveyor and locking the shuttles in said transfer tunnel when a shuttle is carried away by said conveyor and swinging out of the shuttle path and releasing the shuttles for moving to said conveyor.

26. In a loom for weaving of the type having spoolless shuttles, loom drive means, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel to said conveyor, shuttle moving means extending periodically into said receiving tunnel and moving a shuttle sideways from said receiving tunnel into said transfer tunnel, said picking means being connected to and driven by said loom drive means, a mechanism connecting said drive means and said shuttle moving means and comprising timing means holding said shuttle moving means outside said receiving tunnel when a shuttle is picked.

27. In a loom for weaving of the type having spoolless shuttles, loom drive means, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, said transfer means including shuttle passage means and shuttle moving means positively moving said shuttles through said passage means, and a mechanism connecting said loom drive means and said shuttle moving means for operating the latter by said drive means and including adjustable timing means for adjusting the timing of the operation of the shuttle moving means relatively to the loom operation.

28. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism,

a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising a shuttle receiving tunnel, a shuttle transfer tunnel extending laterally from said receiving tunnel to said conveyor, shuttle moving means moving said shuttles individually and sideways from said receiving tunnel into and packing them side by side in said transfer tunnel, a shuttle push out arm having a free end extending periodically into said transfer tunnel and pushing a shuttle toward said conveyor, and an actuating mechanism connected to and actuating said moving means and said push out arm and including adjustable timing means for adjusting the relative timing of the actuation of said moving means and push out arm.

29. In a loom for weaving of the type having spoolless shuttles, loom drive means, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle brake means comprising brake applying and release means, shuttle passage means for passing the shuttles from said brake means to said return conveyor, shuttle moving means moving the shuttles through said passage means, an actuating mechanism connected with said loom drive means, and connecting means individually connecting said brake applying and release means and said shuttle moving means with said mechanism and comprising yielding means yielding upon an improper operation of said brake applying and release means and of said shuttle moving means.

30. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the

shuttles to said return conveyor, this means being adapted to store two or more shuttles.

31. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, this means including a transfer path being so arranged that the shuttles slide along the path on the larger side of their cross section.

32. In a loom for weaving of the type having spoolless shuttles, a shuttle picking mechanism, a shuttle receiving mechanism, a shuttle return conveyor transporting the shuttles from the receiving mechanism to the picking mechanism, said shuttle receiving mechanism comprising shuttle transfer means for transferring the shuttles to said return conveyor, this means comprising two or more plates arranged perpendicularly to the axis of the shuttles and provided with slots in a manner to guide the shuttles from the receiving mechanism to the conveyor.

33. In a loom as defined in claim 32 covering plates are situated between and beyond the guiding plates and fixed to the latter at or near the edges of the slots to form a closed transfer channel.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,099,627	Rossmann	Nov. 16, 1937
2,420,380	Moessinger	May 13, 1947

OTHER REFERENCES

Canadian Textile Journal, June 23, 1948, pages 42–45.