Aug. 14, 1934. R. G. KNOWLAND ET AL 1,970,524

WEAVING MECHANISM

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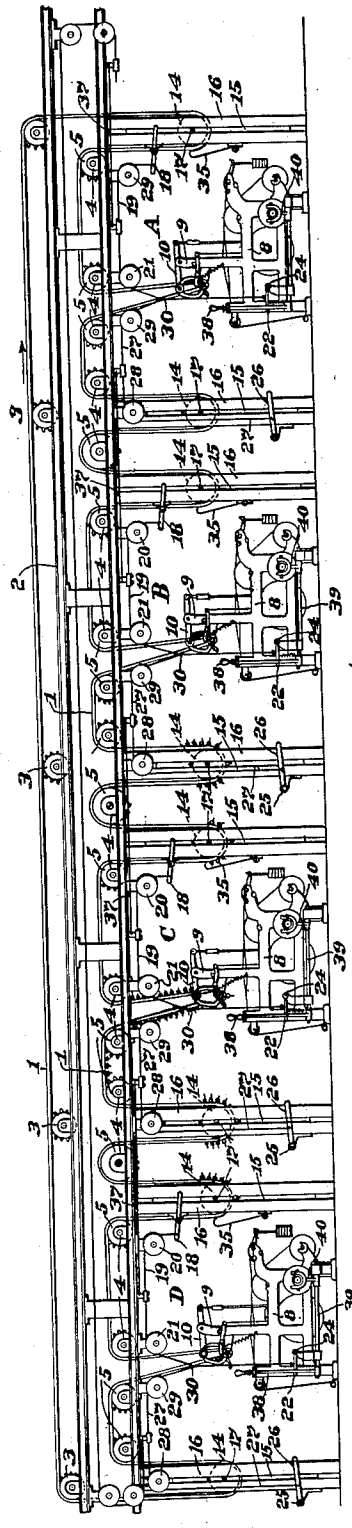


Fig. 1

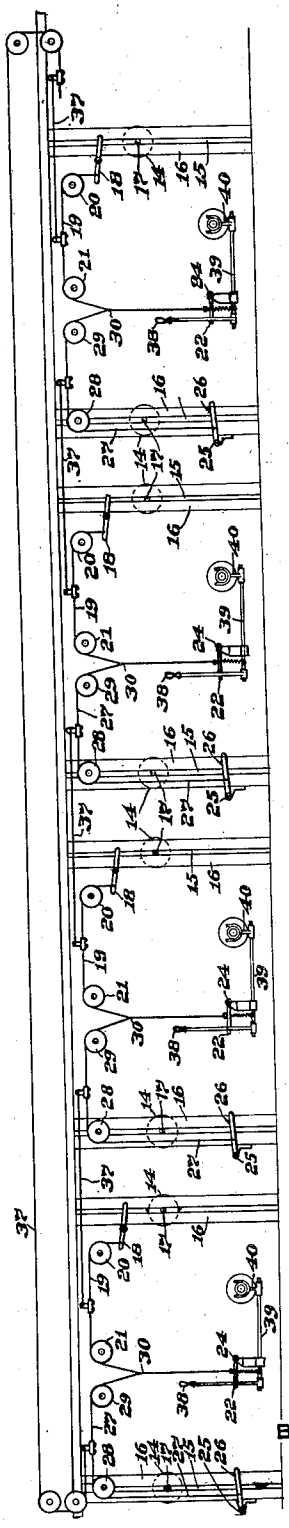


Fig. 2

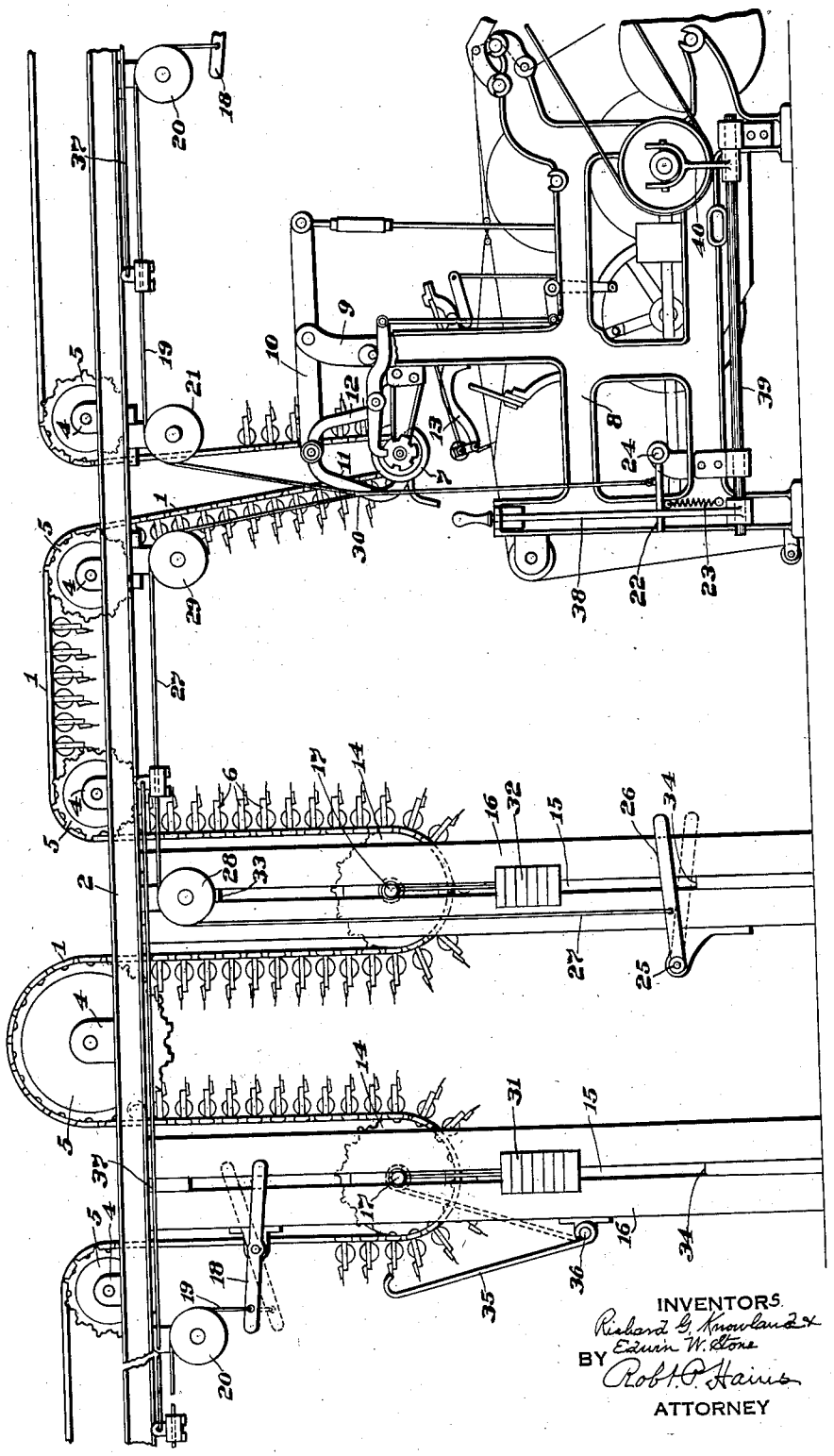
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Fig. 3



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Fig. 4

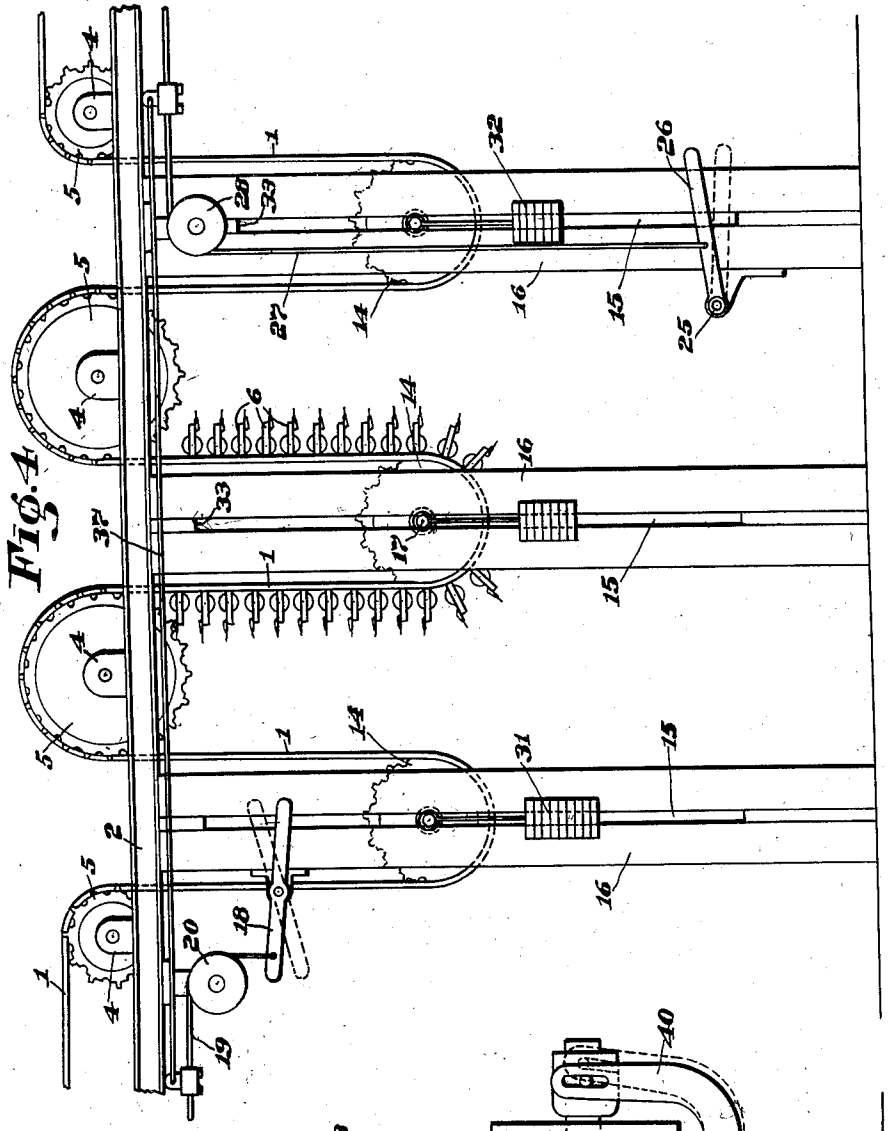
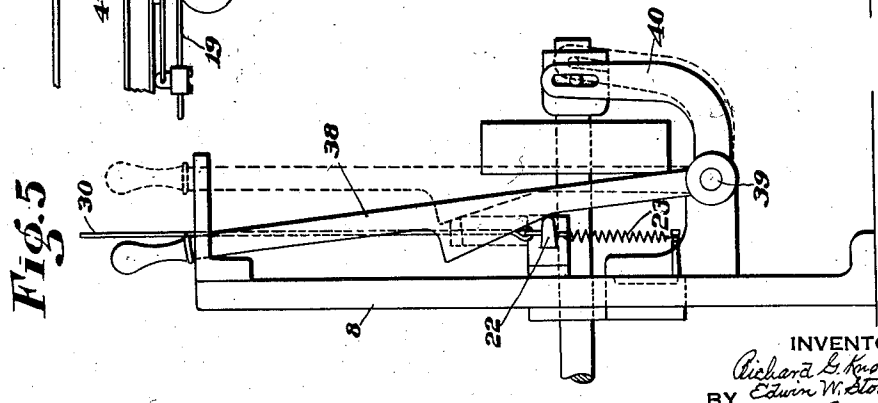


Fig. 5



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WEAVING MECHANISM

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Application January 10, 1933, Serial No. 650,960

14 Claims. (Cl. 139—8)

This invention relates to weaving mechanism for the production of a plurality of tuft pile fabrics from the same tuft yarn carrier or chain, and is a further development of the construction, described and broadly claimed in a prior application filed by applicant Ser. No. 597,446, filed March 8, 1932, now Patent No. 1,897,392, issued Feb. 14, 1933.

Woven pile fabrics may be divided conveniently into two general classes. First, those in which the pile surface is formed by looping certain of the weaving threads over pile wires during the weaving operation and withdrawing the pile wires to leave either a cut or uncut pile surface. Second, those in which the pile surface is produced by pile forming yarns introduced as tufts into the fabric near the weaving point from an extraneous source of supply. Pile fabrics of the second class are generally known as tuft pile fabrics, and may be typified in Axminster or similar carpets and rugs or in those of Oriental or knotted character, and it is to the general weaving mechanism for the production of this class of fabrics that the present invention relates.

In weaving tuft pile fabrics, such as carpets and rugs, the pile forming yarns are supplied to the loom from an extraneous source or carrier, and are transferred in predetermined order to the weaving point to be incorporated into the fabric being woven. In cases where the tuft pile surface is to present a figure or pattern effect, the carrier for the pile forming yarns is frequently of great length, occupies much available floor space, is difficult to manipulate and its initial cost is excessive, with the result that the manufacturing cost of tuft pile fabrics as heretofore produced by the single loom taking its pile forming yarns from a carrier is high.

One of the objects of the present invention is to provide a weaving mechanism of simple construction for the production of tuft pile fabrics and which shall be efficient in operation and wherein the difficulties and objections heretofore existing shall be largely eliminated and the resulting tuft pile fabrics be produced at minimum manufacturing cost.

In accordance with the broad aspects of the present invention a plurality of tuft pile fabric looms are so associated with the same tuft yarn carrier that each of the series is supplied with tuft pile forming yarns from the same carrier with the result that a plurality of tuft pile fabrics are produced where only one before was woven.

In carrying the invention into practical effect the tuft yarn carrier is given a movement relative to the looms of the series for presenting the tuft forming yarns successively to each loom, and in order that a plurality of tuft pile fabrics may be woven simultaneously the invention provides mechanical means for controlling and synchronizing the operations of the looms and this may be attained in various ways, but in the present instance the invention contemplates a mechanically operated means including a mechanical trip and bodily movable transmitting devices controlled by or through the tuft yarn carrier for changing the operative condition of one or more of the looms of the series when the productive capacity of one of the looms of the series varies relative to the productive capacity of others of the series.

During the operations of the series of looms one or more of them may be stopped temporarily for picking out weft shots or tying in warp, and where such condition maintains it is desirable that the remaining looms of the series shall continue to run so that the productive capacity of the weaving mechanism shall not be materially impaired. In carrying this feature of the invention into practical effect a plurality of synchronizing or floating loops in the tuft yarn carrier or chain are associated with each of the looms of the series so that when one loom is stopped as above noted the synchronizing or floating loops will supply a sufficient reservoir of tuft yarn carrier or chain to permit the continued operation of the other looms of the series.

Should the plurality of synchronizing or floating loops associated with one loom of the series become unduly or abnormally shortened it may indicate that the following loom of the series is feeding the tuft yarn carrier or chain at too great a speed, and in order to synchronize the operations of the looms a mechanical trip and bodily movable transmitting connection for modifying the operation of the following loom are provided for actuation to modify the weaving capacity of the following loom when all of the plurality of synchronizing or floating loops have become abnormally shortened. Similarly should the plurality of synchronizing or floating loops become abnormally lengthened it may indicate that the preceding loom of the series should be modified in its operation or stopped, and to this end the invention provides a mechanical trip and bodily movable transmitting devices actuated by the carrier or chain when all of the synchronizing or floating loops of any group be-

come abnormally lengthened, with the result that the preceding loom may be either slowed down or stopped.

The invention and novel features thereof will best be made clear from the following description and accompanying drawings of one good practical form thereof.

In the drawings:—

Fig. 1 is a general side elevation showing a weaving mechanism containing the present invention;

Fig. 2 is a similar side elevation in diagrammatic form of the mechanical synchronizing means for controlling the operations of the series of looms;

Fig. 3 is a side elevation of one of the looms of the series on an enlarged scale and its associated synchronizing or floating loops;

Fig. 4 is a side elevation showing more particularly a plurality of synchronizing or floating loops, three in number, for controlling the mechanical trip and transmitting devices; and

Fig. 5 is a detached detail view showing one form of loom controlling means comprising in this instance a shipper and a shipper knock-off.

As hereinbefore noted the present invention is concerned with the production of tuft pile fabrics, and while different kinds of tuft pile fabric looms may be used for this purpose, the invention will be hereinafter exemplified and described in connection with the looms of the Axminster type, wherein a carrier or chain is provided with tube frames, each of which is supplied with tuft pile forming yarns and the carrier is given a feeding movement to present successive tube frames to each of the looms of the series.

The carrier or chain 1 for the tuft yarns or tube frames is mounted upon a suitable support which, in the present instance comprises a raised or overhead frame 2 preferably mounted on suitable uprights and below the overhead frame 2 are a plurality of Axminster looms A, B, C and D arranged in series of one after the other, and while four of such looms are shown, any convenient number may be employed. The carrier or chain 1 is to be given a feeding or step-by-step movement to present the tuft yarns or tube frames successively to each of the looms of the series and is consequently mounted on rolling elements or sprocket wheels 3 on the frame 2, and where the carrier or chain changes its direction of travel other rolling elements are provided, as shown at 5, which are mounted on bearings 4, the construction being such that the carrier or chain may be given its step-by-step or feed movements and guided in its direction of travel by suitable guiding elements or rollers.

The carrier or chain 1 is provided with tube frames 6 which are arranged on the carrier or chain in a predetermined order and in accordance with the pattern to be produced by the tuft yarn when incorporated with the ground fabric, and in order that the carrier may be given its feed or step-by-step movements, each loom of the series is provided with a carrier feeding device 7 about which the carrier or chain passes, as more clearly indicated in Fig. 3, the construction being such that as long as a loom is in operation the carrier or chain will be fed forward by the feeding device on that loom to present successive tube frames for transfer to the weaving point.

Since each of the looms of the series may be of the usual and well known construction of the Axminster type, only the general features of such looms are shown, and in this respect enlarged Fig. 3 of the drawings is sufficient wherein the loom frame 8 has a riser 9 on which is mounted the feed lever 10 actuated from a going part of the loom, as usual, to impart a rising and lowering movement to the feed pawl carriers 11 and 12 which may be of the usual construction to impart a step-by-step feed movement to the tube frame carrier 1.

Supported by each of the loom frames is the transferrer 13 which may be actuated as usual to detach a tube frame from the carrier or chain 1 and "wipe-in" the tuft yarns at the weaving point.

As hereinbefore intimated the carrier 1 is provided with a large number of tube frames 6 arranged or mounted upon the carrier in a predetermined order and in accordance with the pattern to be produced, and in combining a plurality of tuft pile fabric looms with the same tuft yarn carrier under this condition, due regard must be had to the pattern formation on the several fabrics being woven. Should all of the looms work continuously and at the same speed and be arranged with relation to the travel of the carrier, such that as one loom is taking its appropriate tube frame in accordance with the pattern, another loom of the series is taking its appropriate tube frame in accordance with the same pattern, there will be produced from the same tuft yarn carrier or chain a plurality of fabrics such as rugs, for instance, each of which will present the same pattern effect.

During the weaving operation with the plurality of looms as contemplated by the present invention, it will happen at times that one of the looms of the series may either not run at the same speed as the others or be temporarily shut down for repairs to broken threads and the like, and as an important feature the present invention provides means for synchronizing the operations of the looms, as will now be described.

Each of the looms of the series has associated with it a plurality of synchronizing or floating loops of the chain carrier and, as shown in Figs. 1 and 3, the number of such loops is two, but it is to be understood that any number of synchronizing or floating loops may be employed in carrying out this feature of the invention and three of such loops are indicated in Fig. 4.

One of the important features of the plurality of synchronizing or floating loops consists in providing a reservoir of the tuft yarn carrier or chain for each loom of the series so that should an associated loom be stopped by the loom attendant for the purpose of temporary repairs such as picking out weft shots or tying in warp, the reservoir or the plurality of synchronizing loops permits the remaining looms of the series to continue in operation in the production of a plurality of tuft pile fabrics.

Another important feature of the plurality of synchronizing or floating loops is to control the weaving capacity of either the preceding or following loom as will more fully appear.

As more clearly shown in Figs. 3 and 4 each of the synchronizing or floating loops of the carrier passes about a roll or sprocket 14 which is guided in its up and down movements by guideways 15 formed in the uprights 16. This may be conveniently accomplished by extending the axle 17 of the roll or sprocket into the guideway 15.

From the construction thus far described it

will be apparent that while the series of looms are operating at substantially the same weaving capacity there will be little or no variation in the length of the synchronizing or floating loops, but should a loom, either preceding or following a group of synchronizing or floating loops, vary in its weaving capacity with respect to the other looms of the series then the synchronizing or floating loops will respond thereto, and either shorten or lengthen, as the case may be. For example, should a loom following a group of synchronizing or floating loops be working at an increased speed as compared with the other looms of the series, it will, of course, take up or feed the carrier more rapidly, with the result that the group of synchronizing or floating loops preceding it will become shortened. On the other hand should a preceding loom be working at an increased speed as compared with the other looms of the series then the synchronizing or floating loops of the group will lengthen. The present invention provides mechanical means for controlling the operative capacity of either the following or preceding loom when either of these conditions happen.

Pivotally mounted on the uprights or standards 16 next to the adjacent following loom of the series is a trip 18 having one end connected to a transmitter 19 which passes over a guide pulley 20, then over a guide pulley 21, from which point it leads to the loom controlling means, which in the present instance of the invention, comprises a shipper knockoff 22 normally under the influence of a spring 23 which acts to turn the shipper knockoff 22 downwardly about its pivotal support 24 on the loom frame.

Likewise pivotally mounted at 25 on the upright 16 adjacent the next preceding loom is a trip 26 connected to a transmitter 27 which passes over a guide pulley 28, then over a guide pulley 29 adjacent the next preceding loom and is connected at 30 to the transmitter 19 previously described, the result being that if the mechanical trip 18 is actuated by abnormal shortening of the synchronizing or floating loop next to the following loom, the transmitter 19 will be actuated to thereby modify the operation of or stop the following loom. Should, however, the synchronizing loops become abnormally lengthened, then that next to the preceding loom will actuate the trip 26, Fig. 3 and through the transmitter 27 act to modify or stop the operation of the preceding loom.

While the mechanical trip and flexible transmitter hereinbefore described consitute a good practical form of controlling either the following or preceding loom it is to be understood that the mechanical connections for effecting the purposes stated may be variously contrived.

Connected to the roller or sprocket 14 next adjacent to the loom following a group of synchronizing or floating loops is a weight 31 and connected to the roller or sprocket 14 next adjacent to the preceding loom is a weight 32 which is lighter than the weight 31, the result being that when the synchronizing or floating loops of the carrier 1 are being shortened the lighter roller or sprocket 14 at one end of the group of synchronizing loops will rise until arrested by a stop 33 whereupon the heavier roller or sprocket 14 next adjacent the following loom will rise and eventually actuate the mechanical trip 18 and cause a modification in the operation or stoppage of the following loom. Should the synchronizing or floating loops become lengthened by slackness in the carrier 1 the heavier roller or sprocket 14 will first move downwardly until arrested by a stop 34 whereupon the roller or sprocket 14 having the lighter weight 32 will move downwardly and eventually actuate the mechanical trip 26 and effect a modification or stoppage of the preceding loom.

Where three or more synchronizing or floating loops are provided in a group, as indicated in Fig. 4, the weights attached to the rollers or sprockets 14 will progressively decrease from one end of the group of synchronizing or floating loops to the other in a manner similar to that already described with respect to the synchronizing loops indicated in Fig. 3. In other words, regardless of the number of synchronizing or floating loops that may be employed in any one group the attached weights will be such that the end members of the group will control the operation either of the following or the preceding loom.

It may happen at times that one of the looms of the series may be stopped for a long period of time owing to extensive repairs or otherwise, and in such case it is desirable that the remaining looms of the series shall continue in their productive operations under control of their synchronizing or floating loops. To this end a check device may be used in connection with the floating loop of the stopped loom which is typified in Fig. 3 at 35 as a hook pivotally mounted at 36 on the standard or upright 16 and capable of being manually placed in position to engage the axle 17 of the roller or sprocket 14 and thereby prevent abnormal shortening of the synchronizing loop passing about the roller or sprocket 14. At the same time, as more clearly explained in the patent hereinbefore mentioned, the feed device for the carrier on the stopped loom will be thrown out of action or into an idling position so that the carrier will be actuated thereafter in its feed or step-by-step movements by the looms which still remain in operation. Under this condition the jumper connection 37 is connected to the transmitters 19 and 27 above the synchronizing or floating loops of the stopped loom and hooks 35 are engaged with the shaft 17, Fig. 3 of the sprocket 14 which operates to control the following loom, so that control of the following loom through undue shortening of the loop is rendered inoperative. By preceding loom with reference to any loop, is meant the loom to the right of any such loop. For example loom C, Fig. 1, is the preceding loom to the loops at its left, as shown. Should loom C be stopped for a prolonged period, the hook 35 will be engaged with the shaft 17 at the left of loom C, Fig. 1, and the loom D will then take chain from the loop to the right of the stopped loom and through the now hooked sprocket 14 belonging to the stopped loom, consequently if the loops to the right of the stopped loom become too long loom B which feeds chain to said loops will be stopped, and if said loops become too short loom D will be stopped owing to the jumper or secondary connection 37 over the loops of the stopped loom. If the loops at the right of loom D become too long, Fig. 1, then loom D will be stopped, but should they become too short, then loom A will be stopped. For every loom that is not in running condition the loop associated with that loom will be hooked or held from upward movement and a jumper 37 will be applied to connect the transmitters 19 and 27 above the hooked loop.

When a loom is stopped for a long period and the other looms are to continue in operation, hooks 35 are engaged with the sprocket at left of the stopped loom which prevents contact with the upper actuator or lever and the sprocket becomes a fixed member. In this condition the knock-off or mechanical control feature is maintained by the jumper 37.

While the present invention is associated with a shipper knockoff which may have the effect of stopping either the following or preceding loom, as hereinbefore stated, it is evident, of course, that the operative capacity of either of said looms may be controlled in order to synchronize the operative condition of the series, and as shown in Fig. 5 in the present instance of the invention, the shipper 38 is secured to a shaft 39 from which extends an arm 40 for controlling the operative or inoperative condition of a loom of the series.

The provisions of a plurality of synchronizing or floating loops for each loom of the series enables one or more of the looms to be stopped for temporary repairs while the remaining looms of the series continue in operation, but should a loom of the series be stopped for a prolonged period and it be desired to continue the other looms of the series in operation, the feeding means for the carrier on the stopped loom may be thrown to an idling position and the check device 35 may be moved into operative position to prevent abnormal upward movement of the synchronizing or floating loop at the end of the group associated with the stopped loom, whereupon the carrier will be given its feed movement by the looms which continue to run.

During normal operation of all of the looms of the series the synchronizing or floating loops of any one group will not vary materially in length, but should the productive capacity of a loom in the series vary from normal and cause the loops of a group to shorten or lengthen unduly then the end loops of the group will act to modify the weaving capacity of the following or preceding loom, as the case may be.

What is claimed is:—

1. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a carrier for presenting tuft pile forming yarns in succession to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a mechanical trip for each of the looms of the series arranged to be moved by the carrier, and transmitting devices bodily moved by a trip when it is moved by the carrier for changing the relative weaving capacity of looms of the series.

2. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns in succession to the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a mechanical trip associated with each of the looms of the series arranged for operative movement by the carrier, and a flexible transmitter bodily moved by a trip when it is actuated by the carrier for changing the relative weaving capacity of looms of the series.

3. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns in succession to each of the looms of the series that a plurality of tuft pile fabrics may be woven simultaneously from the same tuft yarn carrier, a shipper knockoff for each loom of the series, a pivotally mounted mechanical trip associated with each loom of the series arranged to be actuated by the carrier, and transmitting devices bodily moved by a trip when it is actuated by the carrier to knockoff the shipper and stop a loom of the series.

4. In a weaving mechanism, the combination of a plurality of looms for weaving tuft pile fabrics, a tuft yarn carrier having a floating loop, means for moving the carrier for presenting the tuft pile forming yarns to each of the looms that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, pivotally mounted mechanical trips for each of the looms arranged to be turned about its pivotal mounting by the carrier upon abnormal variation of the floating loop, transmitting devices bodily moved by a trip when actuated for changing the relative weaving capacity of the plurality of looms.

5. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a shipper knockoff for each of the looms of the series, mechanical trips for each loom arranged to be actuated by the carrier, a bodily movable connection between one mechanical trip and the knockoff of a preceding loom, and a bodily movable connection between another mechanical trip and the knockoff of the following loom of the series that either the preceding or following loom in the series may be stopped when a mechanical trip is actuated by the carrier.

6. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a shipper knockoff for each of the looms of the series, mechanical trips for each loom arranged to be actuated by the carrier, a bodily movable connection between one mechanical trip and the knockoff of a preceding loom, and a bodily movable connection between another mechanical trip and the knockoff of the following loom of the series that either the preceding or following loom in the series may be stopped when a mechanical trip is actuated by the carrier and a link or jumper joining the two connections.

7. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a carrier for tuft pile forming yarns having a plurality of synchronizing or floating loops associated with each of the looms of the series, and means for moving the carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabrics may be woven simultaneously from the same tuft yarn carrier.

8. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a carrier for tuft pile forming yarns having a plurality of synchronizing or floating loops associated with each of the looms of the series, means for moving the carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabrics may be woven simultaneously from the same tuft yarn carrier and means controlled by variation in the length of the plurality of synchronizing or floating

loops for changing the weaving capacity of a loom of the series.

9. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns successively to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a plurality of synchronizing or floating loops formed in the carrier for each of the looms of the series, means controlled by abnormal shortening of one of the loops for changing the weaving capacity of the following loom of the series, and means controlled by abnormal lengthening of another of the floating loops for changing the weaving capacity of a preceding loom of the series.

10. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns successively to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a plurality of synchronizing or floating loops formed in the carrier for each of the looms of the series, a mechanical trip actuated by abnormal shortening of one of the loops for changing the operative condition of a following loom of the series, and a mechanical trip actuated by abnormal lengthening of another of the loops for changing the operative condition of a preceding loom of the series.

11. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns successively to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a plurality of synchronizing or floating loops formed in the carrier for each of the looms of the series, a weight carried by one of the floating loops, means controlled by abnormal shortening of said loop for changing the weaving capacity of a following loom of the series, a lighter weight carried by another of the floating loops, and means controlled by abnormal lengthening of said loop for changing the weaving capacity of a preceding loom of the series.

12. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a tuft yarn carrier for presenting tuft pile forming yarns successively to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same tuft yarn carrier, a plurality of synchronizing or floating loops formed in the carrier for each of the looms of the series, a shipper knockoff for each loom, a mechanical trip and flexible connection with a shipper knockoff of a following loom of the series actuated by abnormal shortening of one of the loops to stop the following loom, and a mechanical trip and flexible connection with a shipper knockoff of a preceding loom of the series actuated by abnormal lengthening of another of the loops to stop the preceding loom.

13. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabrics may be woven from the same carrier and a group of two or more synchronizing or floating loops of the carrier between each two looms of the series to permit a loom to be stopped for temporary repairs while the remaining looms of the series continue to run.

14. In a weaving mechanism, the combination of a series of tuft pile fabric looms, a carrier for presenting tuft pile forming yarns to each of the looms of the series that a plurality of tuft pile fabric may be woven from the same carrier and a group of two or more synchronizing or floating loops of the carrier between each two looms of the series to permit a loom to be stopped for temporary repairs while the remaining looms of the series continue to run and means associated with two of the synchronizing or floating loops of the group to change the weaving operation of a loom of the series when the synchronizing or floating loops become abnormally shortened or abnormally lengthened.

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