Jan. 23, 1945. H. W. START ET AL 2,367,972

STRAIGHT-BAR KNITTING MACHINE

Filed Nov. 24, 1943 3 Sheets-Sheet 1

Fig. 1.

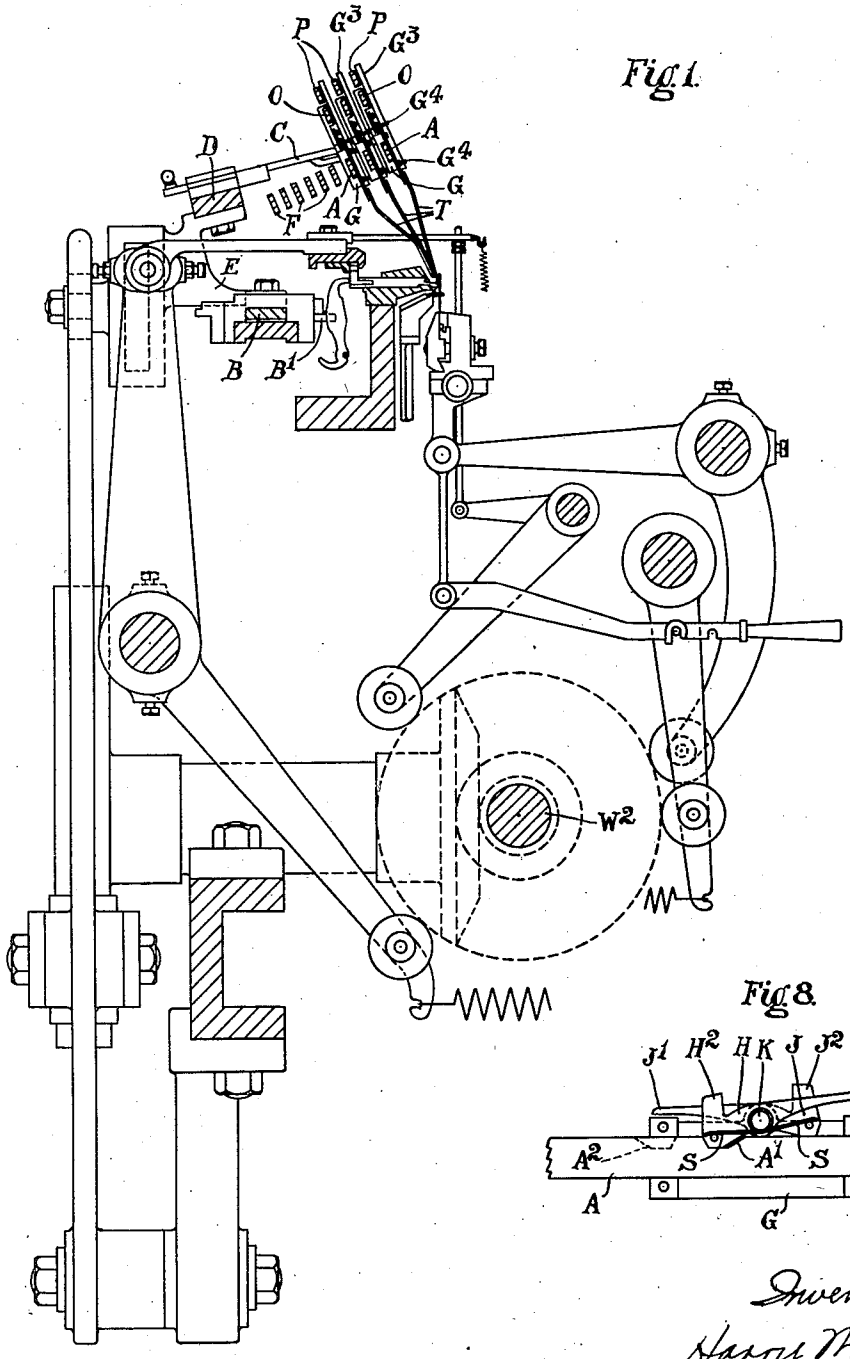


Fig. 8.

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Fig. 2.

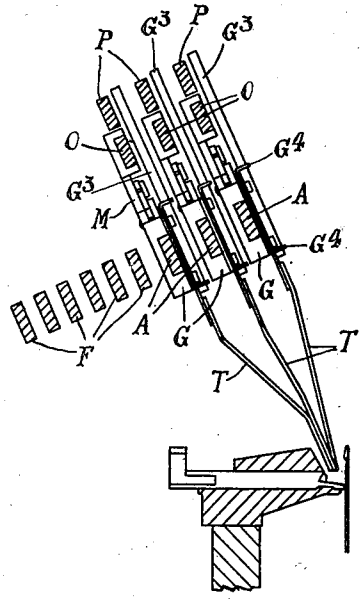


Fig. 3.

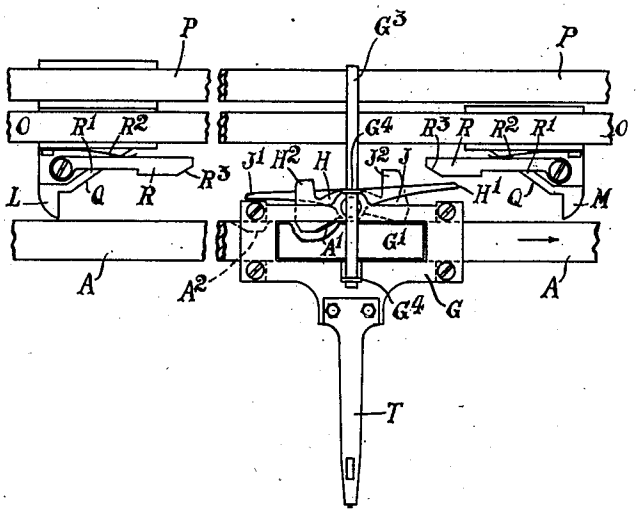


Fig. 4.

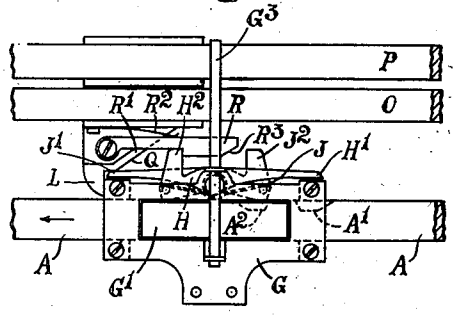


Fig. 5.

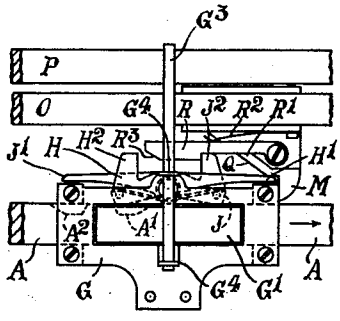
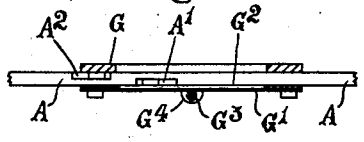


Fig. 6.
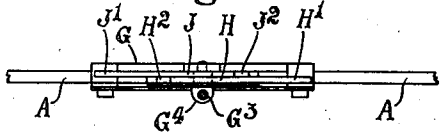


Fig. 7.



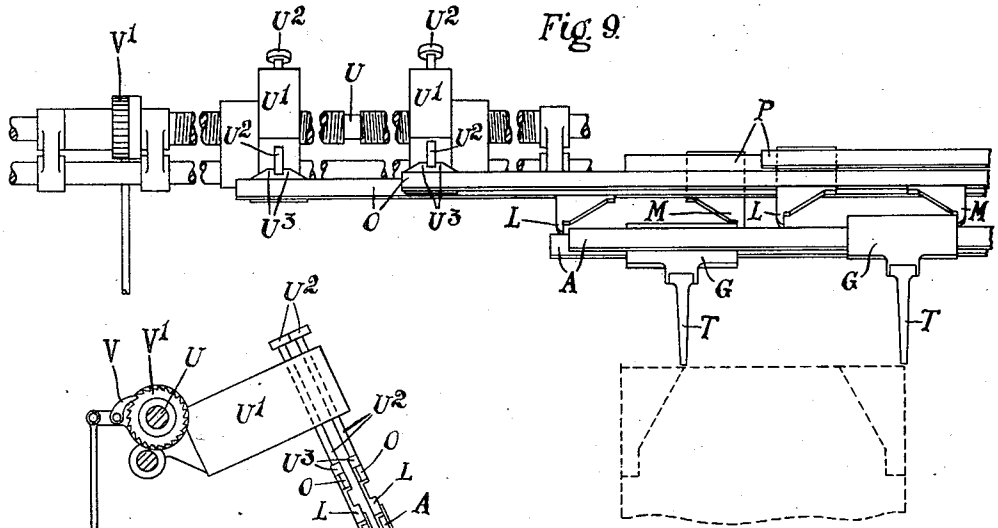
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Fig. 9



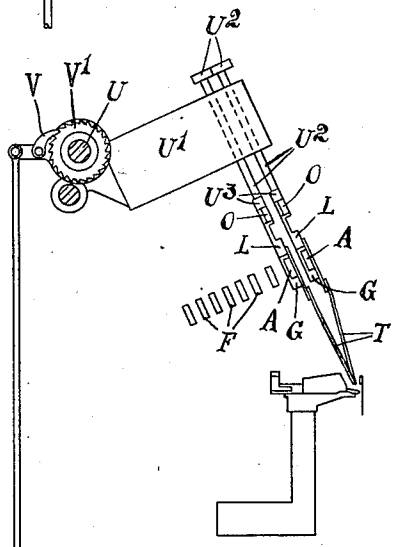
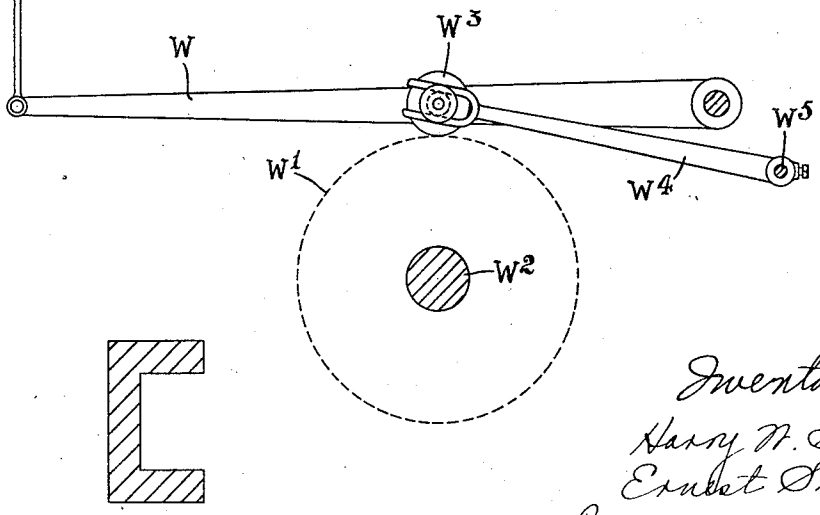


Fig. 10



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STRAIGHT-BAR KNITTING MACHINE

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Application November 24, 1943, Serial No. 511,578
In Great Britain August 29, 1942

13 Claims. (Cl. 66—129)

This invention relates to improvements in straight-bar knitting machines and refers to the method of operating the thread carriers and particularly the plating or splicing thread carriers of such machines. It is well known that when producing plated work on a straight-bar knitting machine the plating thread carriers must traverse only a short distance in front of the slur cock in order to maintain the correct disposition of the plating thread in the work. When work is being produced on less than the full width of the needles the plating thread carriers must be held each course until they are the correct distance in front of the slur cocks and must then immediately start to traverse and maintain their lead of the slur cocks across the full width of the work. The plating thread carriers work only a very short distance in front of the slur cocks and consequently mechanism for slowing down the plating thread carriers when they have nearly reached the end of their traverse cannot be used otherwise the slur cocks would overtake the thread carriers and cause serious damage to the machine. In machines as hitherto constructed the plating thread carriers are frictionally driven and in order therefore to overcome the inertia of the plating mechanism and start at the appropriate moment, and to reduce to a reasonable amount the impact of the plating thread carrier bar or bars on the end stops to prevent excessive wear, the speed of the machine has to be considerably reduced during the production of plated work with a consequent decrease in the output obtainable from the machine.

The object of the present invention is to provide thread carrier mechanism, particularly plating mechanism which will permit of plated or spliced work being produced with the machine running at the same speed as that normally used for the production of ordinary work.

According to this invention the plating thread carriers are each driven by a member reciprocated by a driving bar between end stops. The driven member is preferably mounted on the driving bar and positively driven thereby and the driving connection between the driving bar and the driven member is so arranged that the connection is made when the plating thread carriers are disposed a predetermined distance in front of the slur cocks and broken when the member engages the end stops. Locking mechanism is provided to obviate rebound of the member when it engages the end stops.

The invention will now be more particularly described with reference to the accompanying drawings in which:

Fig. 1 is a sectional side elevation showing part of a straight-bar knitting machine constructed according to our invention,

Fig. 2 is a sectional side elevation showing thread carrier driving members and the driving bars and stop bars associated therewith.

Fig. 3 is a front elevation of a thread carrier driving member and the driving bar, end stops and stop bars associated therewith,

Fig. 4 is a front elevation showing the thread carrier driving member in engagement with the left hand end stop,

Fig. 5 is a front elevation showing the thread carrier driving member in engagement with the right hand end stop,

Fig. 6 is a plan of the thread carrier driving member,

Fig. 7 is a sectional plan of the thread carrier driving member showing the driving bar and driving recesses formed therein,

Fig. 8 is a front elevation of the thread guide driving member with the front of the latter removed showing the connection between the driving bar and driven member when the latter is traversing from left to right,

Fig. 9 is a front elevation showing mechanism for adjusting the position of the outer end stops of two thread carrier driving members adapted to operate the heel splicing thread carriers and

Fig. 10 is a sectional side elevation of part of a straight-bar knitting machine showing the method of adjusting the end stop controlling mechanism shown in Fig. 9.

Figs. 3 to 8 are drawn to a larger scale than the remaining figures.

Only sufficient of the mechanism of a straight-bar knitting machine to enable the invention to be understood is shown in the drawings.

Like letters indicate like parts throughout the drawings.

In carrying out this invention a driving bar A is provided for each plating or splicing thread carrier and this driving bar is mounted in bearings so that it can slide longitudinally and is reciprocated by the draw mechanism of the machine and to the same extent as the slur bar B of the machine. The slur bar B which carries the slur cocks B^1 may be reciprocated in well known manner by Coulier mechanism as shown in Fig. 1 or in any other convenient manner. Each driving bar A provided in the machine is connected to the slur bar in any convenient manner. The connection may be conveniently made

by a bolt C provided in connection with each driving bar and mounted on a bar D attached to the slur bar B brackets E, only one of which is shown in the drawings, the end of the bolt C engaging between abutments provided for the purpose on the driving bar. The driving bars A replace the thread guide bars normally used for operating the slicing thread carriers and are preferably disposed in the same position in the machine and carried by the brackets which carry the normal thread carrier bars F. The use of bolts C as described enables the driving bars to be quickly put into and out of action as required. Mounted on each driving bar A and reciprocated thereby is a member G, hereinafter referred to as the driven member, and in order to provide a driving connection between the driving bar A and the driven member G the following arrangement is adopted.

Pivoted on the driven member G are two oppositely disposed levers H, J. These levers H, J may be mounted on a common pivot K disposed at right angles to the axis of the driving bar A and the ends of the levers H and J are adapted to engage with abutments on the driving bar and provide a driving connection between the driving bar and the driven member. The ends of the levers are so shaped that they provide a driving connection in one direction only and are so arranged that the lever H provides the driving connection when the driving bar moves from left to right and the lever J when driving bar moves from right to left.

In order to control the amplitude of movement of the driven member, end stops are provided. These end stops L, M, see Fig. 3 are mounted on bars O, P which are adjusted longitudinally as will be hereinafter described in order that the distance traversed by the driven member G may be varied from time to time and are so disposed that they engage with the ends of the driven members G as shown in Figs. 4 and 5 or abutments secured thereto.

In order to disconnect the driving connection between the driving bar A and the driven member G when the latter engages the end stops the following arrangement is adopted. Each of the levers H, J previously described is provided with an extension or tail H^1, J^1, which is so disposed that it engages with a cam surface Q on the appropriate end stop and angularly adjusts the lever to disengage it from the abutment on the driving bar A when the driven member G engages the end stop. In order to prevent rebound of the driven member when it engages the end stops, detents R are mounted on the latter and these detents may engage with projections provided in a suitable position on the driven member when the latter engages the end stops and lock it in engagement therewith until such time as the detents are released.

The abutments which engage with the ends of the pivoted levers, H, J previously described may conveniently comprise the ends of recesses A^1, A^2 formed in the driving bar A and shown more clearly in Fig. 7 and a spring S is provided to engage with the levers and move their ends into the recesses at the appropriate time. With this arrangement the projections with which the detents R on the respective end stops L, M engage may comprise extensions H^2, J^2 on the levers H, J so that they automatically disengage from the detents R when the ends of the respective levers move into the recesses. The arrangement works in the following manner. When the driving bar A moves from right to left the lever J engages in the recess A^2 (see Fig. 3) and drives the driven member G towards the left hand end stop L.

As the driven member approaches near to the end stop L the tail J^1 on the lever J engages with the cam surface Q on the end stop L the cam surface Q being so shaped that it disengages the lever J from the recess A^2 in the driving bar just before the driving member G engages the end stop L. At the same time as the driven member G engages the end stop L and the detent R carried thereby engages with the projection H^2 on the lever H, which is in an inoperative position during this motion, and prevents rebound of the driven member from the end stop as shown in Fig. 4. When the driving bar A moves in the reverse direction that is from left to right the detent R is disengaged from the projection H^2 on the lever H when the end of the latter drops into engagement with the recess A^1 in the driving bar when the recess is in the appropriate position and the driven member G is moved from left to right towards the right hand end stop M as shown in Fig. 3. The tail H^1 on the lever H engages the cam surface Q on the right hand end stop M just before the driven member engages therewith and disengages the lever H from the recess A^1. The detent R on the right hand end stop M engages with the projection J^2 on the lever J, which is in an inoperative position during this motion, when the driven member engages the end stop M to prevent rebound as shown in Fig. 5. The projection J^2 will be disengaged from the detent R when the lever J drops into engagement with the recess A^2 in the driving bar A at the appropriate time on the next motion of the driving bar from right to left.

The detents R are normally held on stops R^1 by springs R^2 and they are raised to engage with projections on the levers H, J by the upper ends of the projections engaging with the inclined surface R^3 on the ends of the detents as they pass under them.

In the preferred construction a driving bar A is provided in place of each plating thread carrier bar and is disposed in the machine in the place normally occupied by the plating thread carrier bars. A driven member G is provided in conjunction with each plating thread carrier and these thread carriers T may conveniently be secured to the driven member G as shown in the drawings or be made as a part thereof. It will be understood that in a machine having a plurality of knitting heads the driving bars may extend across any desired number of heads and a driven member and thread carrier is provided for each head of the machine. Recesses A^1, A^2 are provided on the driving bar for each driven member and these recesses are disposed so that the plating thread carrier T always starts its motion when it is the correct distance in front of the slur cock and it maintains this position relative to the slur cock until it has completed its motion. Two stop bars O, P are provided in conjunction with each driving bar, the left hand end stop for each driven member being disposed on one bar and the right hand end stop on the other.

The bars O, P are moved longitudinally to adjust the position of the end stops to control the shape of the splicing and may be moved from time to time as is necessary by any convenient mechanism.

In Fig. 9 two plating or splicing thread carriers T are shown and the outer end stops are

carried by the bars O whilst the inner end stops are carried by the bars P. It will be understood that similar plating thread carriers and associated end stops will be provided in connection with each knitting head across which the driving bars A extend. The stop bars O may be moved at the appropriate time by screw and nut mechanism comprising a screw U formed with right and left hand screw threaded parts each provided with a nut U^1 carrying a bolt, U^2, adapted to engage between abutments U^3 provided on the stop bars. The screw U is turned to the requisite extent to move the stop bars and adjust the position of the end stops by a pawl V (see Fig. 10) engaging with a ratchet wheel V^1 secured to the screw U, the pawl being operated by a lever W angularly adjusted by a cam W^1 on the mainshaft W^2 of the machine engaging with a truck W^3 on the lever W. The truck W^3 is moved into and out of engagement with the cam W^1 at the appropriate times in well known manner by an arm W^4 secured on a shaft W^5 which is longitudinally adjusted by a stud on the pattern chain or control drum of the machine. Similar ratchet and pawl mechanism may be provided to turn the screw U in the reverse direction. The bars P which carry the inner end stop are moved by mechanism similar to that described for moving the stop bars O so that independent control of the outer and inner end stops is provided to enable any desired shape of the plated or spliced work being obtained.

In order to prevent the driven members bonding forward when a lever thereon engages with the driving bar at the start of the drive, a light frictional connection may be provided between the driven members and the driving bar.

In order to obtain this frictional connection a spring plate G^1 may be provided and be disposed in an opening provided for the purpose in the front of the driving member G. The spring plate is provided on its rear side with a frictional lining G^2 (see Fig. 7) and is held up to the front face of the driving bar A by a rod or tube G^3 engaging in openings formed for the purpose in lugs G^4 formed in the front of the driving member. Preferably a tube is used to hold the spring plate G^1 in its operative position and extends up to a point above the stop bars so as to form a thread guide to keep the thread clear of the adjacent stop and driving bars.

The above description describes the invention in connection with the operation of the plating or splicing thread carriers. Figs. 1 and 2 show three driving bars and associated stop bars, two of the driving bars are adapted to operate the heel and sole splicing carriers shown in Fig. 9 whilst the third may be used to operate the toe splicing carrier. It will however be understood that the mechanism described may also be used to operate any of the other thread carriers in the machine and the recesses in the respective driving bars arranged so that the thread carriers in operation at any one time always move in a constant relation to each other. It will be seen that the traverse of the driven members is controlled by the end stops and that the driving bar traverse the same distance as the slur bar and as the recesses in the driving bar are shaped so that they drive in one direction only the levers will be returned to an inoperative position if they engage in their respective recesses when the driving bar is moving in the wrong direction to drive the driven member through that particular lever.

With the construction described the driven members A can be made very light in weight and consequently they can be moved into operation at high speed whilst at the same time maintaining the correct position of the plating thread carriers relative to the slur cocks and brought to rest from a high speed without heavy impact with the end stops so that plated work can be produced at the same speed as normal knitting without undue wear and tear of the machine.

In an alternative construction one driven member constructed and operated as described is utilised to operate each normal plating thread carrier bar. With this arrangement however the driven member would need to be of more robust construction and consequently of much greater weight than those used in the previous arrangement and furthermore the plating thread carrier bar would also need to be started and stopped each motion of the machine when plating. The weight of the moving parts with this arrangement are consequently much more than that of the moving parts in the construction previously described with a consequent increase in the wear on the machine when run at high speed.

What we claim as our invention is:

1. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, oppositely disposed levers pivoted on the member, a reciprocating driving bar for each member, abutments on each reciprocating driving bar to engage with the levers on its associated member to drive the latter, end stops to limit the movement of the members and means to disconnect the levers from the abutments when the members engage with or are close to the end stops.

2. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, oppositely disposed levers pivoted on the member, a reciprocating driving bar for each member, recesses in the driving bars to receive the ends of the levers of the associated members to drive the latter, end stops to limit the movement of the members and means to disengage the levers from the recesses when the members engage with or are close to the end stops.

3. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, oppositely disposed levers pivoted on the member, a reciprocating driving bar for each member, recesses in the driving bars to receive the ends of the levers of the associated members to drive the latter, end stops to limit the movement of the members, cam surfaces on the end stops and tails on the levers to engage with the cam surface on the appropriate end stop to disengage them from the recesses when the members engage with or are close to the end stops.

4. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, a reciprocating driving bar for each member, oppositely disposed levers pivoted on each member, recesses in each driving bar to receive the ends of the levers of the associated member to drive the latter, end stops to limit the movement of the members, means to disengage the levers from

the recesses when the members engage with or are close to the end stops, extensions on the levers and detents on the end stops to engage with the extension on the appropriate lever to prevent rebound of the member when it engages with the end stops.

5. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, a reciprocating driving bar for each member, oppositely disposed levers pivoted on each member, recesses in each driving bar to receive the ends of the levers of the associated member to drive the latter, a spring to move the levers into the recesses, end stops to limit the movement of the members, means to disengage the levers from the recesses when the members engage with or are close to the end stops and means to prevent rebound of the member from the end stops when it engages therewith.

6. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers each mounted on a driving member, a reciprocating bar for each driving member, levers pivoted on the driving members and adapted to engage with abutments on the reciprocating bars to drive the thread carriers a predetermined distance in front of the slur cocks, end stops to limit the movement of the driving members, means to disengage the levers from the abutments when the driving members engage with or are close to the end stops, and means to prevent rebound of the driving members when they engage with the end stops.

7. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers each mounted on a driving member, a reciprocating bar for each driving member, levers pivoted on the driving members, said reciprocating bars having recesses therein to engage with the ends of the levers and drive the thread carriers a predetermined distance in front of the slur cock, springs on the levers to move them into engagement with the recesses, end stops to limit the movement of the driving members, means to disengage the levers from the recesses when the driving members engage with or are close to the end stops and means to prevent rebound of the driving members when they engage with the end stops.

8. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, a reciprocating driving bar for each member, catches providing a positive driving connection between the member and the reciprocating bar, end stops to limit the traverse of the member, means to adjust the position of the end stops to vary the traverse of the member, and means to disengage the catches when the member engages with the end stops.

9. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a member to drive each thread carrier, a reciprocating bar for each driving member, levers pivoted on the driving members and adapted to engage with abutments on the reciprocating bars to drive the thread carriers a predetermined distance in front of the slur cocks, a light frictional contact between the driving members and the reciprocating bars to prevent the driving members bounding forward when the levers engage with the abutments, end stops to limit the traverse of the driving members, means to disengage the levers from the abutments when the driving members engage with or are close to the end stops, and means to prevent rebound of the driving members when they engage with the end stops.

10. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a driving bar for each thread carrier, a driving member for each driving bar, a reciprocating bar for each driving member, pivoted levers adapted to engage with abutments to provide a driving connection between the driving members and the reciprocating bars, end stops to limit the traverse of the driving members, means to disengage the levers from the abutments when the driving members engage with or are close to the end stops, and means to prevent rebound of the driving members when they engage with the end stops.

11. A straight-bar knitting machine according to claim 10 in which the levers are formed with tails adapted to engage with cam surfaces on the end stops to disengage the levers from the abutments when the driving members engage with or are close to the end stops.

12. A straight-bar knitting machine according to claim 10 in which the levers are formed with extensions which are engaged by detents on the end stops when the driving members engage therewith to prevent rebound of the driving members from the end stops.

13. A straight-bar knitting machine comprising in combination with each knitting head of the machine of one or more thread carriers, a driving bar for each thread carrier, a driving member for each driving bar, a reciprocating bar for each driving member, a driving connection between the reciprocating bars and driving members, end stops to limit the movement of the driving members, means to disengage the driving connection when the driving members engage with or are close to the end stops and means to prevent rebound of the driving members when they engage with the end stops, said driving connection comprising oppositely disposed levers pivoted on the driving members and having ends adapted to engage with abutments formed on the reciprocating bars.

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