July 25, 1939. K. R. LIEBERKNECHT 2,166,959

KNITTING MACHINE

Filed Dec. 24, 1937

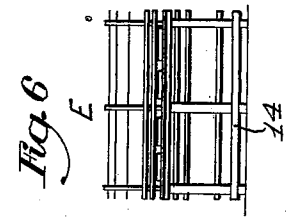


Fig. 6

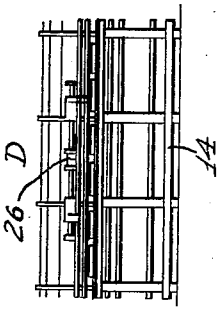


Fig. 5

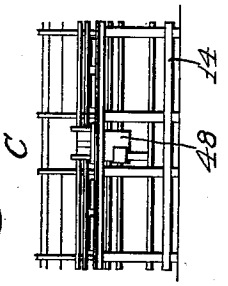


Fig. 4

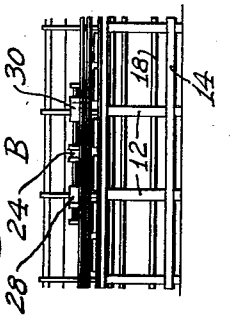


Fig. 3

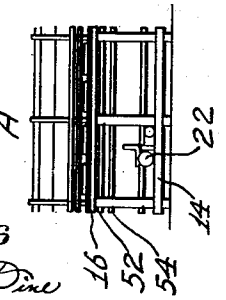


Fig. 2

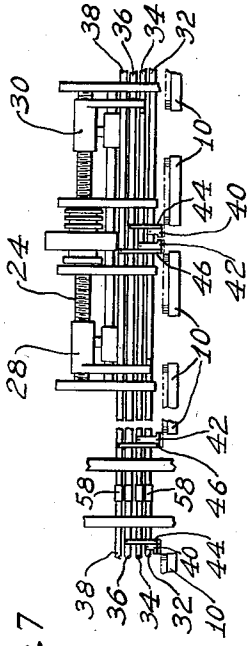


Fig. 7

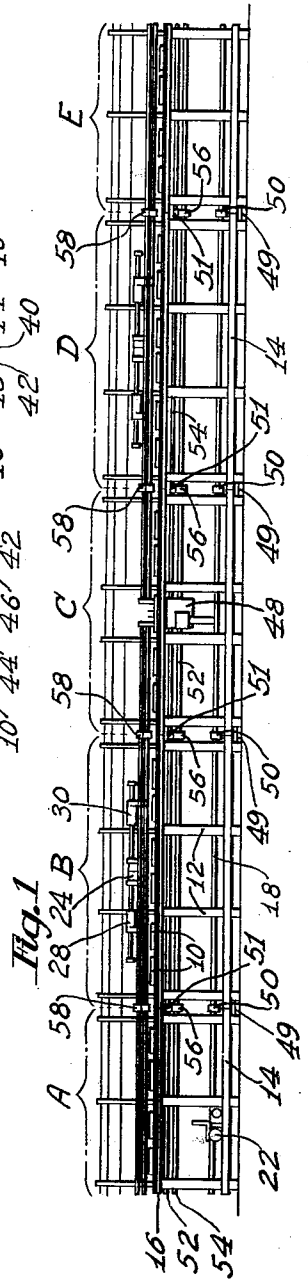


Fig. 1

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UNITED STATES PATENT OFFICE

2,166,959

KNITTING MACHINE

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In Germany December 28, 1936

2 Claims. (Cl. 66—82)

The present invention relates to improvements in multiple section flat knitting machines, and more particularly to improvements in the construction and organization of full-fashioned machines of this general description, to facilitate in the transportation to and setting up of these machines in the mill.

In accordance with usual manufacturing methods, each machine is set up in the factory where it is run-in and the various adjustments are made so far as possible to condition the machine for commercial operation immediately when set up in a knitting mill. Because of the great length and complexity of these machines, it has been found necessary to almost wholly dis-assemble the machine for shipment. The re-assembling and re-adjustment of the machine in the mill is then a difficult job requiring the services of a skilled operative who is ordinarily sent out from the factory, and requiring a minimum of several weeks for its completion. Among the most important of the adjustments which must be made after the parts of the machine have been lined up along its length, are those relating to the operation of lengthwise moving parts as, for instance, the slur-cocks, yarn carriers and loop transfer mechanisms cooperating with the several sections. With the usual organization of these machines, the lengthwise moving parts for each individual section are supported and controlled by means of lengthwise movable rods extending over a relatively large number of sections of the machine. The narrowing fingers associated with each section, for example, are secured to lengthwise movable rods, and must be adjusted with extreme precision to secure an accurate positioning of these elements to cooperate with the needles of each individual section.

It is a principal object of the present invention to provide a novel and improved construction and organization of a flat full-fashioned knitting machine of this general description, which will permit of the dis-assembly of the machine into sizeable units for shipment, and a subsequent re-assembly of these units without in any manner disturbing the adjustment or operating relationships of the many interrelated cooperating machine parts along the length of the machine.

With this and other objects in view, as may hereinafter appear, a feature of the invention consists in the provision of a multiple section flat knitting machine in which the supporting frame is constructed and arranged to take the form of a number of separate supporting units provided at each end with a transverse supporting frame, and in which all of the lengthwise supporting rails for the machine, together with all of the driving and controlling members extending along the length of the machine for simultaneous actuation and control of a plurality of knitting sections, are arbitrarily broken off between each of these divisible units of the machine frame in such a manner as to permit the coupling together of these parts between the machine units, whereby the portions of the machine comprised by the several divisible units may be readily assembled together to provide a single operating unit of the entire machine.

The several features of the invention consist also in the devices, combinations and arrangement of parts hereinafter described and claimed, which together with the advantages to be obtained thereby will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawing, in which Fig. 1 is a view in front elevation of a twenty-four section knitting machine having the usual driving and controlling mechanisms associated with flat full-fashioned hosiery machines; Figs. 2 to 6 inclusive, are similar views of the separate divisible units of the machine illustrated in Fig. 1; and Fig. 7 is a detail sectional view in front elevation illustrating on an enlarged scale one of the narrowing spindles and the narrowing fingers controlled thereby.

The invention is herein disclosed as embodied in a preferred form in a multiple section flat full-fashioned knitting machine which may be of ordinary construction, consisting of twenty-four knitting sections, each of which comprises a bank of spring beard needles movable as a unit and generally designated at 10 in the drawing. Inasmuch as the construction and mode of operation of these machines is well known in the art and forms specifically no part of the present invention, only a diagrammatic showing of such a machine has been made in the drawing.

The machine frame consists of a series of transverse frames 12 which are spaced along the length of the machine, one for each two knitting sections 10, and are supported rigidly in position by means of longitudinally extending rails, of which the front rail 14 and work table 16 are specifically illustrated in the drawing. The knitting instrumentalities including the needles 10 for each of the several knitting sections are driven from a main cam shaft 18 extending the full length of the machine, through connections which are well known in the art and need not here be described. At the left hand end of

the machine are provided the usual mechanisms for shogging the cam shaft 18 axially to the narrowing position, and the drive for the pattern chain control diagrammatically illustrated at 22 in Figs. 1 and 2 of the drawing. There are also provided the usual narrowing spindles 24 and 26, of which the spindle 24 is arranged to control the operation of the narrowing fingers cooperating with the twelve sections comprising the left half of the machine, the narrowing spindle 26 being arranged to control the position of the narrowing fingers cooperating with the twelve sections comprising the right half of the machine. As shown in greater detail in Fig. 7 of the drawing, the narrowing spindle 24 is comprised of two oppositely threaded portions having mounted thereon the nuts 28 and 30 which operate in the usual manner to control the lengthwise positions of four supporting bars 32, 34, 36 and 38 which extend along the length of the twelve sections comprising the left half of the machine. The bars 32 and 34 provide support respectively for the left and right wide narrowing fingers 40 and 42, and the bars 36 and 38 provide support respectively for the left and right small narrowing fingers 44 and 46. Inasmuch as these mechanisms are well known in the art, no further description or illustration thereof is believed necessary.

In accordance with a principal feature of the present invention, the machine illustrated in the drawing, is constructed and arranged to permit the dis-assembly of the machine into a number of divisible units suitable for shipping, without in any way disturbing the organization and adjustment of the several cooperating mechanisms. To this end, the machine frame is constructed and arranged in the form of five divisible units indicated respectively at A, B, C, D and E. The units A and E as shown in Figs. 2 and 6 of the drawing, each comprise four machine sections which are supported by means of three transverse frames 12. These frames are spaced one for each two knitting sections to provide a support for the several operating shafts and machine connections between the two pairs of knitting sections and at both ends of each divisible unit A and E. The units B and D illustrated specifically in Figs. 3 and 5 of the drawing, each comprise six knitting sections of the machine, which are supported by means of four transverse frames 12, one such transverse frame being provided between each pair of knitting sections 10 and also at each end of the operating unit. The unit C which comprises the central portion of the machine, is similarly constructed with a transverse supporting frame 12 at each end of the unit, and two additional frames at the adjacent ends of the two pairs of sections which are separated from one another to provide sufficient space for the usual driving and operating connections including the driving motor unit generally indicated at 48 for the main cam shaft 18.

It will readily be seen from an inspection of the drawing, that the sub-division of the machine into a plurality of divisible units has been accomplished without the necessity of any duplication of the several operating and controlling mechanisms for the machine. Instead, each of the lengthwise extending members including the longitudinally supporting rails, the rotatable shafts and other parts which normally extend along the length of the machine from one section to another, have been formed of separate parts which are supported by and extend beyond the supporting transverse frames located at each of the several divisible units into abutting relationship to one another, so that they can readily be coupled together to perform the usual function of the corresponding parts of machines of this type which are normally manufactured in one piece and extend from section to section along the length of the machine. However, when the couplings are removed, each of the separate units is completely self-contained, and can be shipped without any disturbance of the adjustments or operative relationships of the several mechanisms embodied therein.

This mode of construction and assembly of the machine is well illustrated in the drawing, in which the front rail 14 and work table 16 are shown as formed of five separate parts which are brought into abutting relation for securing together by coupling means indicated at 49 and 51 when the several units of the machine are assembled. The main cam shaft 18 and also the rock shafts 52 and 54 illustrated as forming part of the usual organization of these machines, are similarly formed of separate parts which are arranged to be coupled together into separate operating units respectively by the couplings 50 and 56.

As best shown in Fig. 7 of the drawing, the supporting bars 32, 34, 36 and 38 for the large and small narrowing fingers, are similarly formed of three separate parts arranged to be connected together by couplings 58, so that the narrowing points associated with each of the knitting sections comprised by the left half of the machine, will be operated as a single unit by the usual narrowing spindle 24 mounted in that portion of the machine comprised by the separable unit B. When the machine is assembled in operating position as shown in Fig. 1 of the drawing, the adjoining end transverse frames 12 of each of the divisible units will be spaced from one another a distance which is just sufficient to permit the introduction of coupling members for all of the lengthwise extending supporting rails, movable shafts and other members which normally extend along the length of the machine from one to another of the divisible units A, B, C, D and E above described. With this construction and arrangement of the several operating and supporting members extending along the length of the machine, it will readily be seen that a minimum of effort is required for the disassembly of the machine into separate units suitable for shipping, and that each separate unit, formed at each end with transverse supporting frames 12 as above described, provides a self-supporting organization of the several parts contained therein, which is suitable for packing, and is not readily susceptible of injury from subsequent handling. When the machine is again assembled, it is necessary only to line up the several units of the machine in the proper positions, and to couple together the several parts as previously set forth. Inasmuch as the majority of adjustments to the several operating mechanisms of the machine have previously been made and have not been disturbed in the process of dis-assembly and shipping, very little skill and a minimum of time is required for the setting up of the machine for active operation.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a multiple section knitting machine, the combination with knitting instrumentalities including a series of knitting needles and fashioning devices associated with each section, of a machine frame comprising a plurality of transverse supporting frames including two such transverse frames spaced from one another and interposed between two adjoining knitting sections, connecting members for said transverse frames extending along the length of the machine, each of said members being comprised of separate parts having the abutting portions thereof located between said spaced transverse frames, a plurality of driving and controlling members extending along the length of the machine for the simultaneous actuation and control of the knitting and fashioning devices associated with a plurality of sections, each of said driving and controlling members being comprised of separate parts having the abutting portions thereof located between said spaced transverse frames, and means for coupling together the abutting ends of each of said driving and controlling member parts located between said spaced transverse frames whereby a simultaneous operation of the knitting and fashioning devices associated with a plurality of knitting sections located on both sides of said spaced transverse frames is effected by said driving and controlling members.

2. In a multiple section knitting machine, the combination with knitting instrumentalities including a series of knitting needles and fashioning devices associated with each section, of a machine frame comprising a plurality of transverse supporting frames including two such transverse frames spaced from one another and interposed between two adjacent knitting sections, connecting members for said transverse frames extending along the length of the machine, each of said members being comprised of separate parts having the abutting portions thereof located between said spaced transverse frames, a plurality of driving and controlling members extending along the length of the machine for the simultaneous actuation and control of the knitting and fashioning devices associated with a plurality of sections located at opposite sides of said spaced transverse frames, each of said driving and controlling members being comprised of separate parts having the abutting portions thereof located between said spaced transverse frames, and means for coupling the abutting portions of all of said parts whereby the portions of the machine comprised by said parts and the transverse frames associated therewith may be readily assembled together to provide a single operating machine unit.

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