

Nov. 15, 1938.

R. C. AMIDON

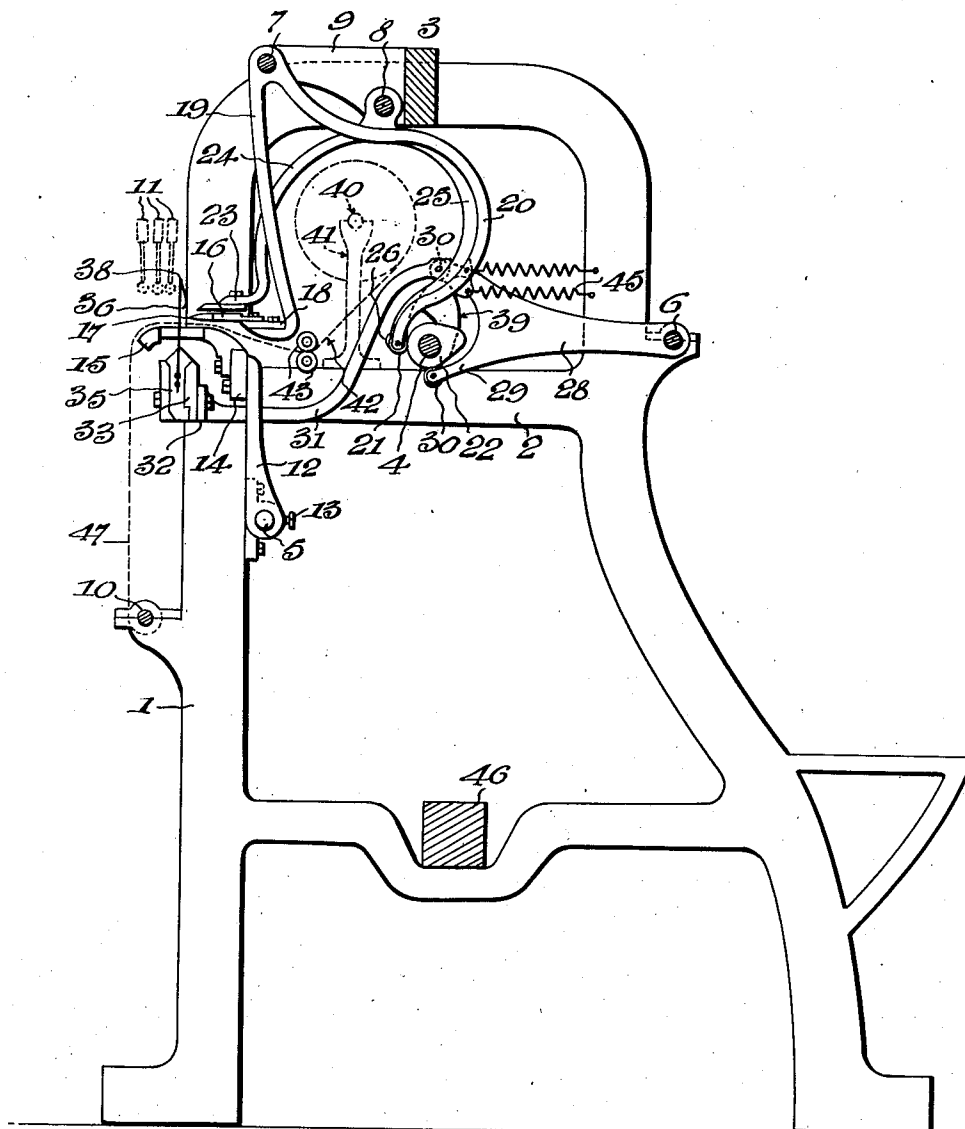
2,136,368

KNITTING MACHINE AND METHOD OF KNITTING

Filed Oct. 27, 1937

4 Sheets-Sheet 1

*Fig. 1.*



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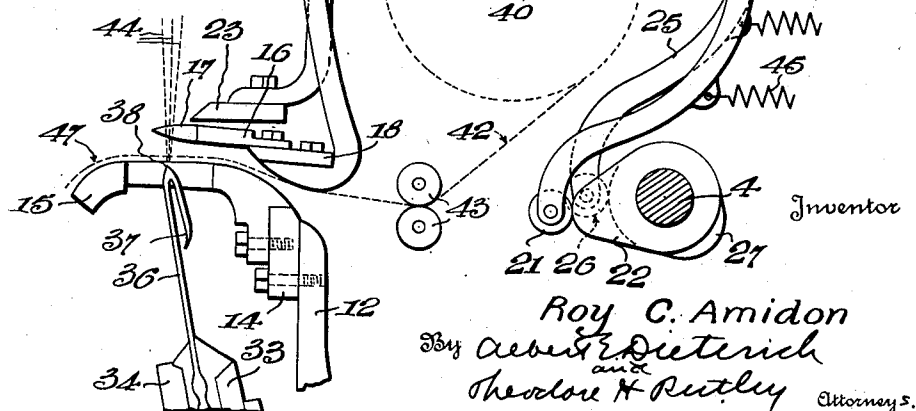
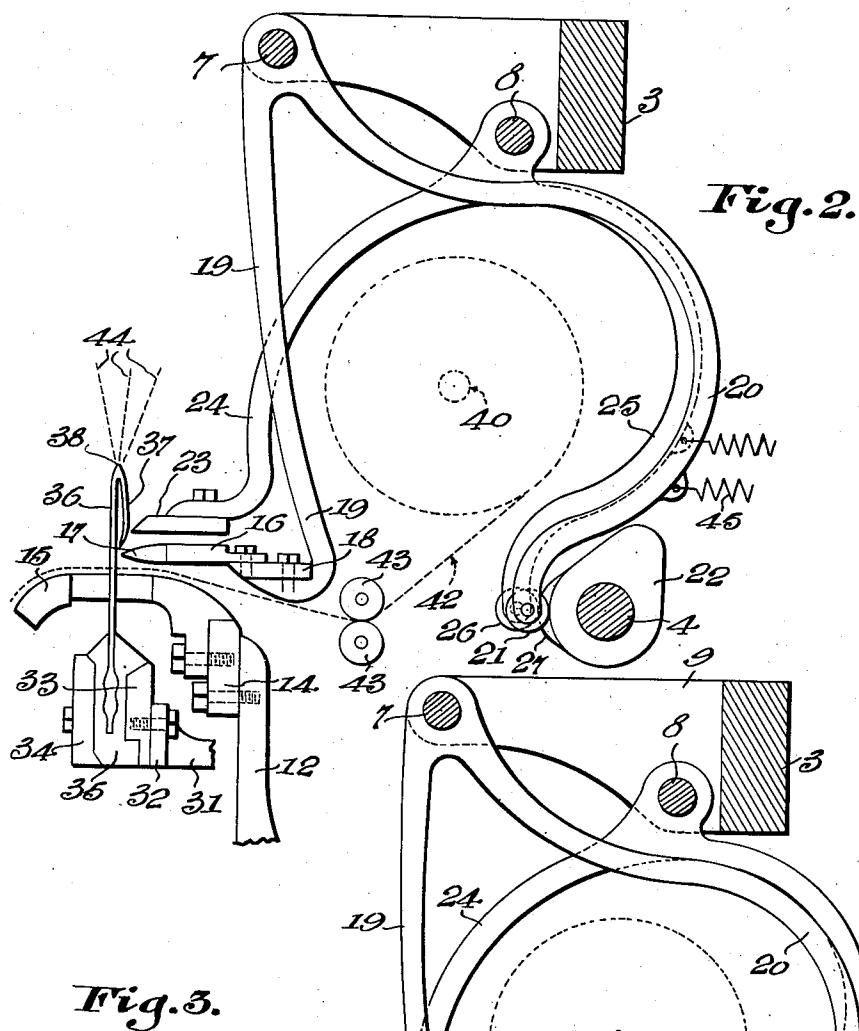
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# KNITTING MACHINE AND METHOD OF KNITTING

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Fig. 4.

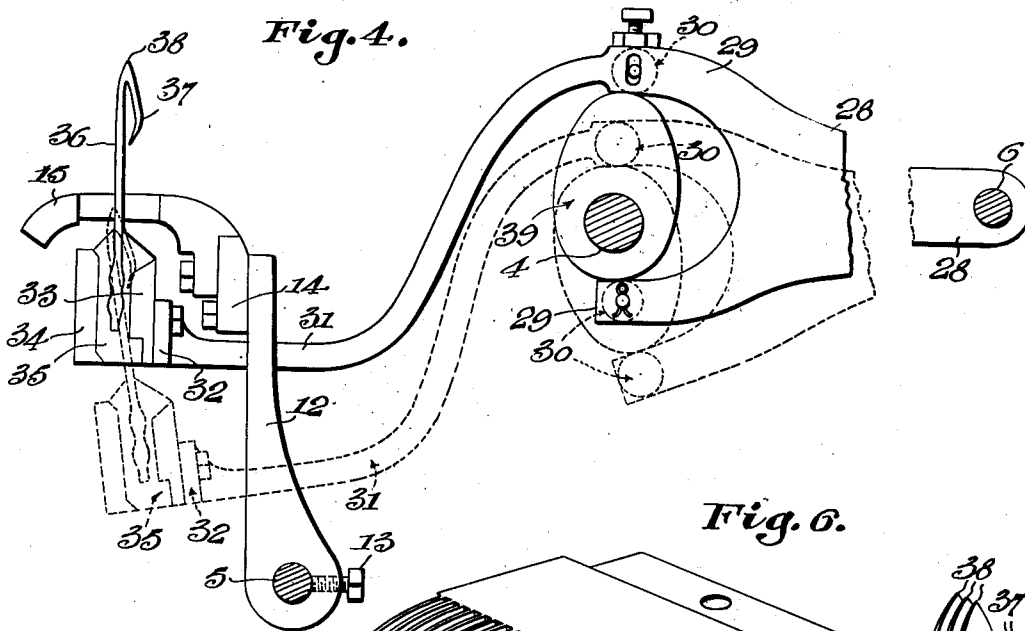


Fig. 6.

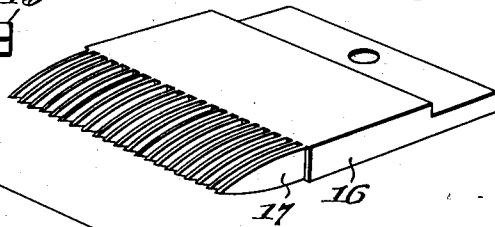


Fig. 5.

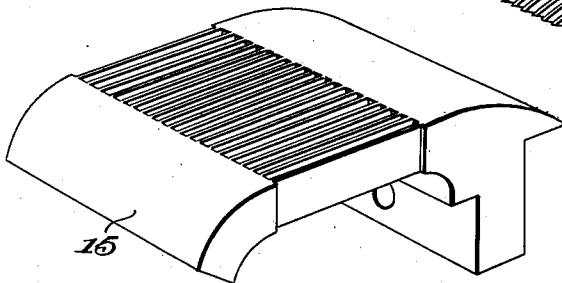


Fig. 7.

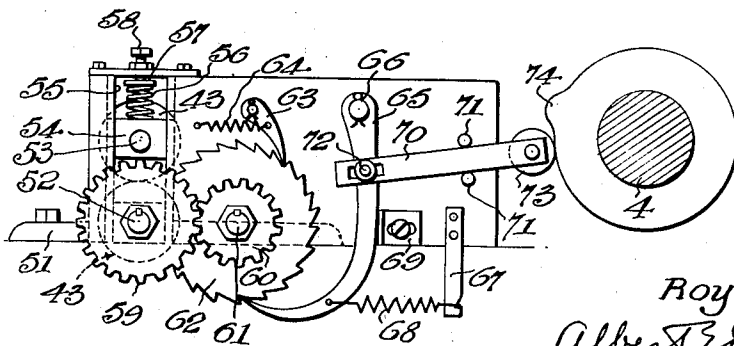
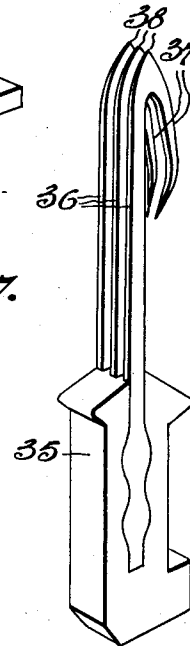


Fig. 10.

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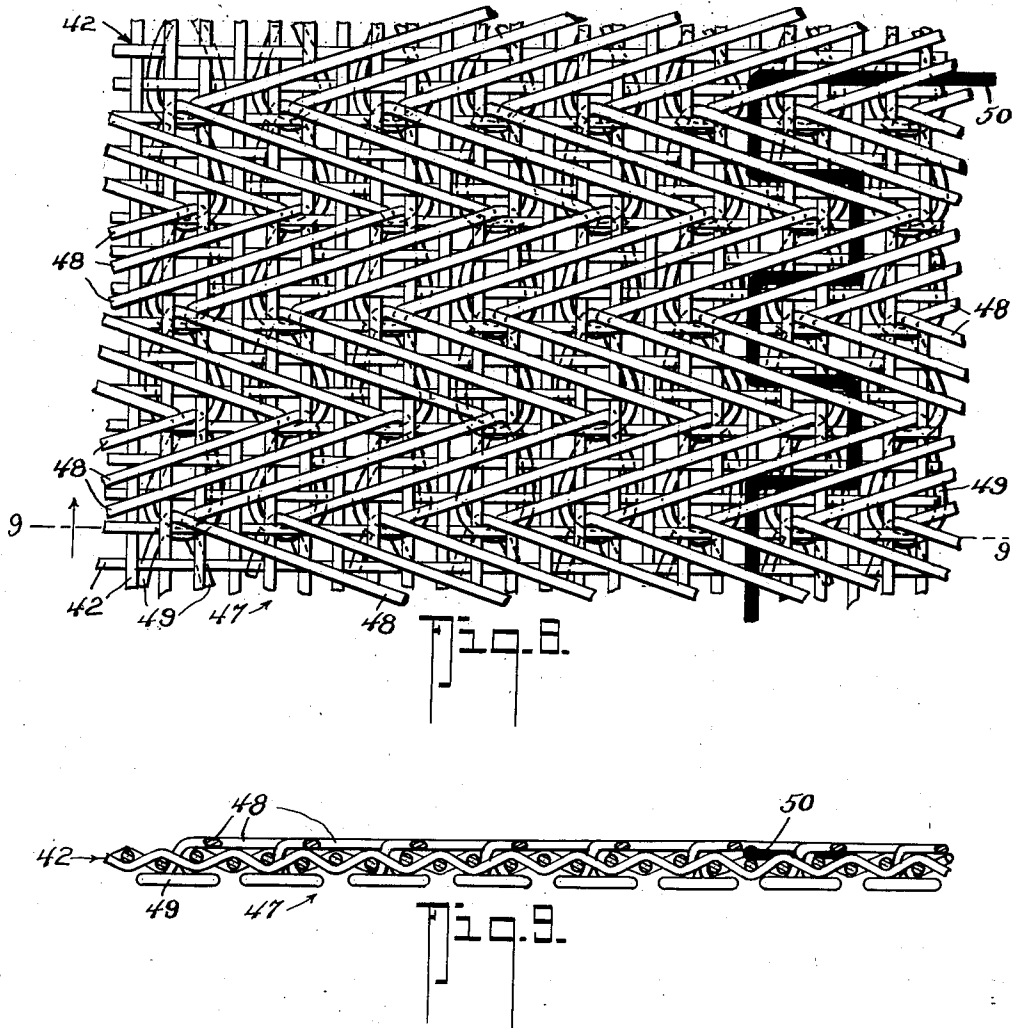
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KNITTING MACHINE AND METHOD OF KNITTING

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4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE

2,136,368

KNITTING MACHINE AND METHOD OF  
KNITTING

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Application October 27, 1937, Serial No. 171,297

16 Claims. (Cl. 66—84)

My invention, which relates to the art of knitting, has for its object to provide an improved knitting machine for the manufacture of upholstery fabrics, etc.

Further, it is an object of the invention to provide means to adapt knitting machines of the tricot and similar types to the convenient and economical manufacture of flat-knit, substantially non-stretchable fabric, as, for example, that referred to in my application Ser. No. 167,323, filed October 4, 1937.

A further object of the invention is to provide an improved method whereby flat knitting machines can be used in the production of the fabric which constitutes the subject matter of my application filed October 4, 1937, aforesaid.

Again, it is an object to provide a knitting machine adapted to knit through a previously made fabric in such manner that a portion of the knitting will lie on one face of the previously-made fabric while the remainder of the knitting will lie on the other face thereof, the knitting operation taking place in the same way as when no previously-made fabric is used, thus enabling the new fabric to be provided with inlays on one face and making it possible to produce on one face of the new fabric all the many designs and ornamental effects that can now be produced by knitting fabrics in the present-day flat-knitting machines.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a cross section through a tricot-type knitting machine, modified for the convenient carrying out of my invention.

Figure 2 is a detail view showing the positions of the parts when the needle is starting down, after receiving the thread from the thread carrying guides (shown in Figure 1), the needle bar arm and its operating cam being omitted in the interest of clearness, the beard presser bar having closed the needle.

Figure 3 is a view similar to Figure 2 but showing the parts in the position where the needle is down, having drawn the thread through the previously-formed fabric (usually finely-woven textile fabric), the beard-presser bar having been

withdrawn and the sinker-nib having been projected to operative position.

Figure 4 is a detail view of the needle bar, needle, needle plate, needle bar arm and its operating cams (master and counter).

Figure 5 is a magnified detail perspective view of one sinker section.

Figure 6 is a magnified detail perspective view of a corresponding sinker nib section.

Figure 7 is a magnified perspective view of a corresponding needle section.

Figure 8 is a top face view of a highly-magnified portion of a composite fabric such as may be made by the present machine.

Figure 9 is a section on the line 9—9 of Fig. 8.

Figure 10 is an elevation on an enlarged scale of a mechanism that may be used to feed the fabric 42 from the roll in timed relation to the knitting functions so as to avoid drag on the needles.

In the drawings, in which like numerals and letters of reference designate like parts in all of the figures: I have shown my invention as applied to a tricot-type machine, although it may be incorporated in some other types of flat knitting machines which may be susceptible to the required modification; so I do not wish to be limited to the one type shown, except in so far as the limitations are expressed in the appended claims.

In the present drawings 1 designates the end frames of the machine which are connected by suitable bars 3 and 46. The end frames 1 have cross-bars 2 which carry the bearings for the usual cam shaft 4. Below the bars 2, on the rear of the front legs of the end frames 1, is carried a stationary shaft or bar 5 on which the sinker-bar arms 12 are stationarily secured by any suitable means, as, for example, by set screws 13.

On the rear of the frame is journaled, in suitable bearings, a shaft 6 on which is pivoted the needle bar arms 28, the latter having forks 29, with rollers 30, to straddle the usual needle-operating cams (master and counter) 39. The arms 28 have extensions 31 which pass beneath the sinker-bar 14 and have ears 32 on their ends to which is attached the needle bar 33. The needles 36 have their base 35 held to the bar 33 by a needle plate 34 in the usual way.

The needles 36 have their ends pointed as at 38 and they are provided with the usual beards 37.

Pivotaly suspended from a shaft 7 are sinker-nib-carrying arms 19 to which the sinker-nib bar 18 is attached. The bar 18 carries the sinker-nib

17 and base 16, the parts 16 and 18 being spaced above the knock-over-sinker 15 (that is carried by the bar 14), a sufficient distance to allow passage of the base fabric 42, hereinafter again referred to. The arms 19 have extensions 20 which terminate adjacent the cam shaft 4 and carry cam-engaging rollers 21 that engage the sinker-nib cam 22 and are held in engagement in any well-known way, as, for example, by a spring 45.

10 Located, as usual, above the sinker-nib 17 and the base 16, is a beard-presser bar 23 carried by arms 24 that are pivoted on a shaft 8 and have extensions 25 carrying rollers 26 to engage the beard presser cams 27.

15 It should here be understood that there may be several arms 19 and 24 to support the bars 18 and 23 respectively; only one or both end bars need have the extensions 20 and 25 respectively.

The roll of previously-formed fabric 42 (which preferably is a relatively fine, thin-woven fabric of the required tensile strength) is mounted with its core 40 in suitably located brackets 41 so disposed and designed that the roll of fabric may be inserted through the end frame of the machine, the extensions 20 and 25 being designed to permit this.

The sheet of fabric 42 is passed, preferably, between guide rolls 43 (which, if desired, may be geared together and driven in timed relation to the movements of the knitting needles, etc. from any suitable rotating shaft of the machine) and over the bar 14 and knock-over-sinker 15 and below the sinker-nib 16 and its base (17), see dotted lines in Figures 1, 2 and 3.

35 The composite fabric 47, as it passes from the knock-over-sinker, is rolled up on a suitable core carried by the winding-up shaft 10.

The usual thread carrying bars (one or more) 11, with thread guides, are mounted and operated in the known manner and therefore a detailed drawing of the mounting and operating means therefor is thought to be unnecessary, as the same will be readily apparent to those skilled in the art. It is by the proper manipulation of the bars 11, carrying threads 44, that the ornamental designs and inlays are formed on the upper face of the base fabric 42 during the passage of the same through the machine.

Since the knitting threads are laid on both faces of the fabric 42 and remain unbroken, and since the technique of knitting as such is not required to be changed, it will be obvious that there is an almost unlimited range in the number and kinds of designs which the top face of the composite fabric can be given. As both faces of the composite fabric have surfaces composed of unbroken threads, either face of the combined fabric can be used as the exposed face in upholstery.

60 One example of the composite fabric 47 is given in Figures 8 and 9, for purposes of illustration only. By reference to these figures it will be seen that this base fabric 42 is composed of relatively close woven threads, the upper face of which is covered by the upper portion of the knitting threads 48 and the lower face of which is covered by the lower portions 49 (loops) of the knitting threads.

Threads 50 may be inlaid in the upper face of the composite fabric, as indicated in Figure 8.

The mechanism shown in Figure 10 comprises bases 51 suitably attached to the cross bars 2 and each carrying a bearing guide 55 for the bearings in which the shafts 52 and 53 of the guide rollers 43 are mounted; the upper bearings 54

being urged toward the lower bearings (carrying shaft 53) by springs 56 having caps 57 to be engaged by tension-adjusting screws 58.

At one end the shaft 53 has a gear 59 keyed to it, the gear 59 meshing with a gear 60 on a stub shaft 61 to which is also secured a replaceable ratchet disc 62. This disc is held, to rotate in one direction only, by a back-check pawl 63 and spring 64 and is advanced tooth by tooth, through the medium of a feed-pawl 65 pivoted at 66 on a suitable part of the support 51 and held against an adjustable stop 69 by a spring 68 anchored to a fixed arm 67; the feed-pawl 65 is operated by a cam 74 on shaft 4 which acts on a roller 73 carried by a reciprocating bar 70 guided between pins 71 and adjustably secured at 72 to the pawl 65.

By properly adjusting the connection 72 and stop 69, the distance ratchet 62 is advanced at each revolution of the cam 74 can be regulated to accord with the particular movement of the needle and the particular distance the knitting is advanced with each operation of the needle. If necessary to allow for longer movements than can be compensated for by these adjustments, different sized (more or less number of teeth) ratchets 62 can be used interchangeably as required.

By using differently colored threads and yarns in the needle guides, many striking patterns may be formed which will greatly enhance the salability of the cloth and since, by the use of my improvements, present-day knitting machines can be easily converted to the manufacture of substantially non-stretchable fabric capable of use as upholstery material, the value of such knitting machines is correspondingly increased; the machines can be used either for making knit fabrics, or for making the new composite fabric at a moment's notice without changing the structure or timing of the parts of the machine involved.

From the foregoing description, taken in connection with the accompanying drawings, it is thought that the construction, operation and many advantages of my invention will be apparent to those skilled in the art.

What I claim is:

1. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to pass a previously-formed sheet of fabric in the out-going direction of the knitting between said knock-over-sinker and said sinker-nib.

2. In combination with a flat knitting machine having a bearded knitting needle, a knock-over-sinker, a sinker-nib, a beard-presser bar, thread carrying bars with thread guides and means to operate the aforesaid structure to effect the knitting operations; of means to pass a previously-woven base sheet of fabric between said knock-over-sinker and said sinker-nib during the knitting operation of the machine, in virtue of all of which the knitting takes place through said base sheet of woven fabric leaving an unbroken part of the knitting on one face of the base sheet and the remainder of the same on the other face of the base sheet.

3. In a flat knitting machine, a stationary knock-over-sinker, a movable sinker-nib, a pointed bearded needle, a movable beard-presser bar, means to support said sinker-nib and said beard-presser bar for movement over said knock-

over-sinker, means to support said needle for movement up and down through said knock-over-sinker, a movable thread carrying bar having a thread guide, means to actuate said sinker-nib, said needle, said beard-presser bar and said thread carrying bar to effect the movements thereof in timed relation and in cooperation with said knock-over-sinker to cause the knitting operation to be performed, and means to pass a previously-formed fabric through the machine between said sinker-nib and said knock-over-sinker during the knitting operation of the machine.

4. In a flat knitting machine, a stationary knock-over-sinker, a movable sinker-nib, a pointed bearded needle, a movable beard-presser bar, means to support said sinker-nib and said beard-presser bar for movement over said knock-over-sinker, means to support said needle for movement up and down through said knock-over-sinker, a movable thread carrying bar having a thread guide, means to actuate said sinker-nib, said needle, said beard-presser bar and said thread carrying bar to effect the movements thereof in timed relation and in cooperation with said knock-over-sinker to cause the knitting operation to be performed, and means to pass a previously-formed fabric through the machine between said sinker-nib and said knock-over-sinker continuously during the knitting operation of the machine.

5. In a flat knitting machine, a pair of end frames connected by longitudinal bars, said end frames having cross bars carrying shaft bearings, a cam shaft journaled in said bearings, a second shaft journaled in bearings to the rear of the cam shaft, needle-bar arms mounted on said second shaft and having a fork to straddle the cam shaft, needle operating cams on said cam shaft and rollers on said fork to engage said cams, said needle-bar arms having forward extensions, a needle bar carried by said extensions, bearded needles carried by said needle bar, a stationary shaft carried by said end frames located below and to the front of said cam shaft, sinker-bar arms secured to said stationary shaft, a sinker bar carried by said sinker-bar arms, a knock-over-sinker carried by said sinker-bar and projecting forwardly of the machine, in a position to cooperate with said needles, a sinker-nib located above and spaced from said knock-over-sinker, pivoted arms pendently supported in said frame and carrying said sinker-nib, a cam on said cam shaft and operating connections between said last-named cam and said pivoted arms for actuating said sinker-nib, a beard-presser bar and beard-presser bar arms pendently and pivotally supported in said frame, a cam on said cam shaft for cooperation with one of said beard-presser bar arms to actuate the same, means to support a roll of fabric in the machine, and means to pass said fabric through between said knock-over-sinker and said sinker-nib while the machine is knitting.

6. In a flat knitting machine, a pair of end frames connected by longitudinal bars, said end frames having cross bars carrying shaft bearings, a cam shaft journaled in said bearings, a second shaft journaled in bearings to the rear of the cam shaft, needle-bar arms mounted on said second shaft and having a fork to straddle the cam shaft, needle operating cams on said cam shaft and rollers on said fork to engage said cams, said needle-bar arms having forward extensions, a needle bar carried by said extensions,

bearded needles carried by said needle bar, a stationary shaft carried by said end frames located below and to the front of said cam shaft, sinker-bar arms secured to said stationary shaft, a sinker bar carried by said sinker-bar arms, a knock-over-sinker carried by said sinker-bar and projecting forwardly of the machine, in a position to cooperate with said needles, a sinker-nib located above and spaced from said knock-over-sinker, pivoted arms supported in said frame and carrying said sinker-nib, a cam on said cam shaft and operating connections between said last-named cam and said pivoted arms for actuating said sinker-nib, a beard-presser bar and beard-presser bar arms pivotally supported in said frame, a cam on said cam shaft for cooperation with one of said beard-presser bar arms to actuate the same, means to support a roll of fabric in the machine, and means to pass said fabric through between said knock-over-sinker and said sinker-nib while the machine is knitting.

7. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to support a roll of previously-formed sheet fabric in the machine, and means to feed the same in the out-going direction of the knitting between the knock-over-sinker and the sinker-nib so as to avoid drag on the needles.

8. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to support a roll of previously-formed sheet fabric in the machine, and means to feed the same through the machine step-by-step between the sinker-nib and said knock-over-sinker, while the knitting operation is taking place.

9. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to support a roll of previously-formed sheet fabric in the machine, and means to feed the same through the machine between the sinker-nib and said knock-over-sinker, while the knitting operation is taking place.

10. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to support a roll of previously-formed sheet fabric in the machine, and means to feed the same through the machine between the sinker-nib and said knock-over-sinker, while the knitting operation is taking place, said feeding means comprising a pair of feed rolls, a pawl and ratchet device for cooperating with said rolls, and a cam-actuated means to operate said ratchet.

11. The combination with a flat knitting machine which includes bearded knitting needles, a knock-over-sinker, a sinker-nib, a beard-presser bar, and a thread carrying bar with thread guide and means to operate the same to effect the known knitting operation; of means to support a roll of

previously-formed sheet fabric in the machine, and means to feed the same through the machine between the sinker-nib and said knock-over-sinker, while the knitting operation is taking

- 5 place, said feeding means comprising a pair of feed rolls, a pawl and ratchet device for cooperating with said rolls, a cam-actuated means to operate said ratchet, and means to adjust the "stroke" of said ratchet device to accord with the  
10 adjustment of the knitting instrumentalities.

12. The method of making a composite sheet of textile material in a knitting machine of the type which employs a knock-over bar and a sinker-nib; said method consisting in passing a base-sheet of woven textile material between the knock-over bar and the sinker-nib during the knitting operation of the machine in order that the threads will be knit through said base-sheet and leave an unbroken portion of the knitting on one face of the base-sheet and the remainder of the same on the other face of the base-sheet.

13. The method of making a composite sheet of textile material in a knitting machine of the type which employs a knock-over bar and a sinker-nib; said method consisting in passing a base-sheet of textile material between the knock-over bar and the sinker-nib during the knitting operation of the machine in order that the threads will be knit through said base-sheet and leave an unbroken portion of the knitting on one face of the base-sheet and the remainder of the same on the other face of the base-sheet.

14. The method of making a composite sheet

of textile material in a knitting machine of the type which employs a knock-over bar and a sinker-nib; said method consisting in passing a base-sheet of woven material between the knock-over bar and the sinker-nib during the knitting operation of the machine in order that the threads will be knit through the base-sheet and leave an unbroken portion of the knitting on one face of the base-sheet and the remainder of the same on the other face of the base-sheet.

15. The method of making a composite sheet of textile material in a knitting machine of the type which employs a knock-over bar and a sinker-nib; said method consisting in passing a base-sheet of woven textile material between the knock-over bar and the sinker-nib during the knitting operation of the machine in order that the threads will be knit through the base-sheet and leave a portion of the knitting on one face of the base-sheet and the remainder of the same on the other face of the base-sheet.

16. The method of making a composite sheet of textile material in a knitting machine of the type which employs a knock-over bar and a sinker-nib; said method consisting in passing a base-sheet of material between the knock-over bar and the sinker-nib during the knitting operation of the machine in order that the threads will be knit through the base-sheet and leave a portion of the knitting on one face of the base-sheet and the remainder of the same on the other face of the base-sheet.

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