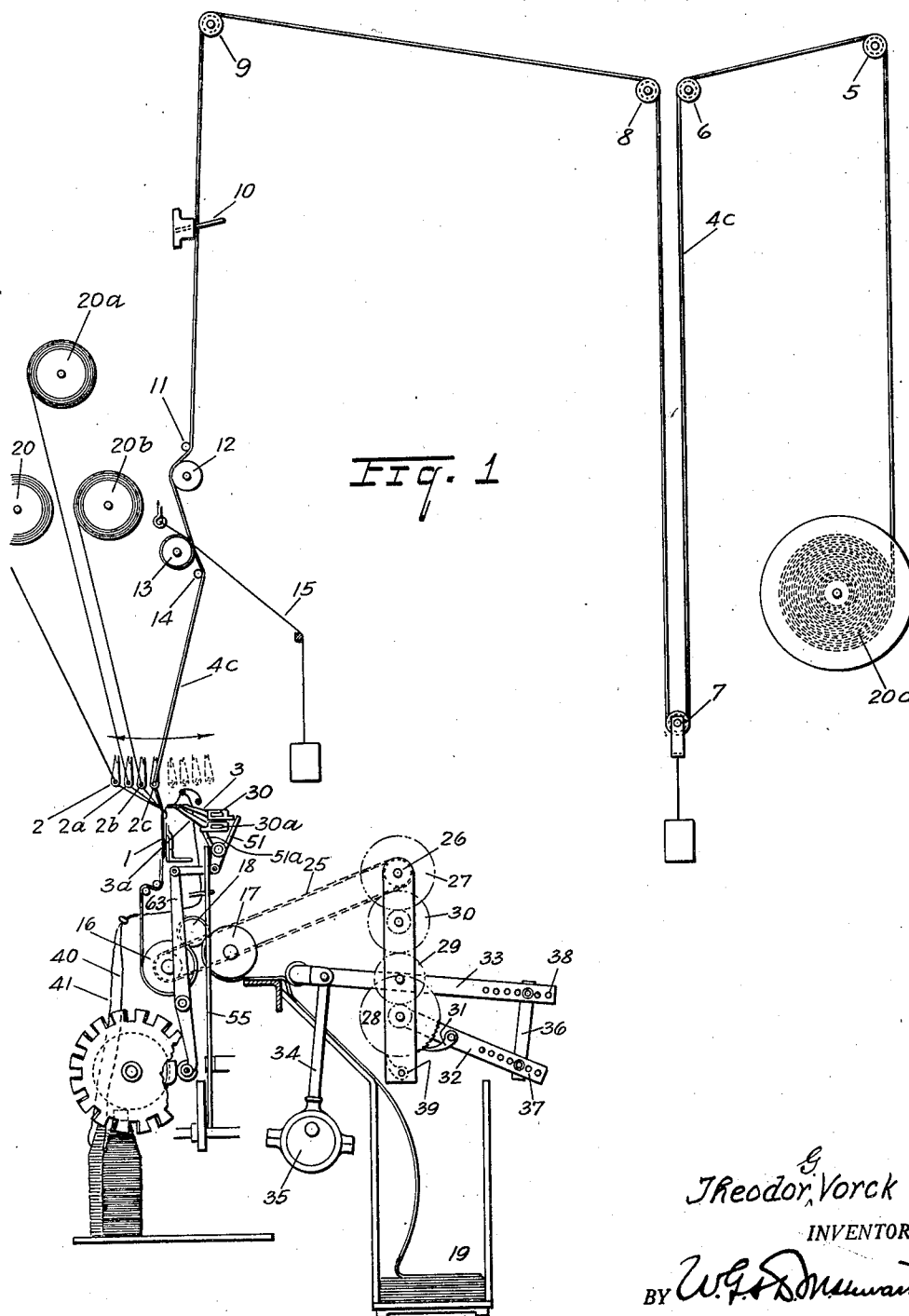


March 26, 1929.

T. G. VORCK
WARP KNITTING MACHINE
Filed June 21, 1927

1,706,426

3 Sheets-Sheet 1



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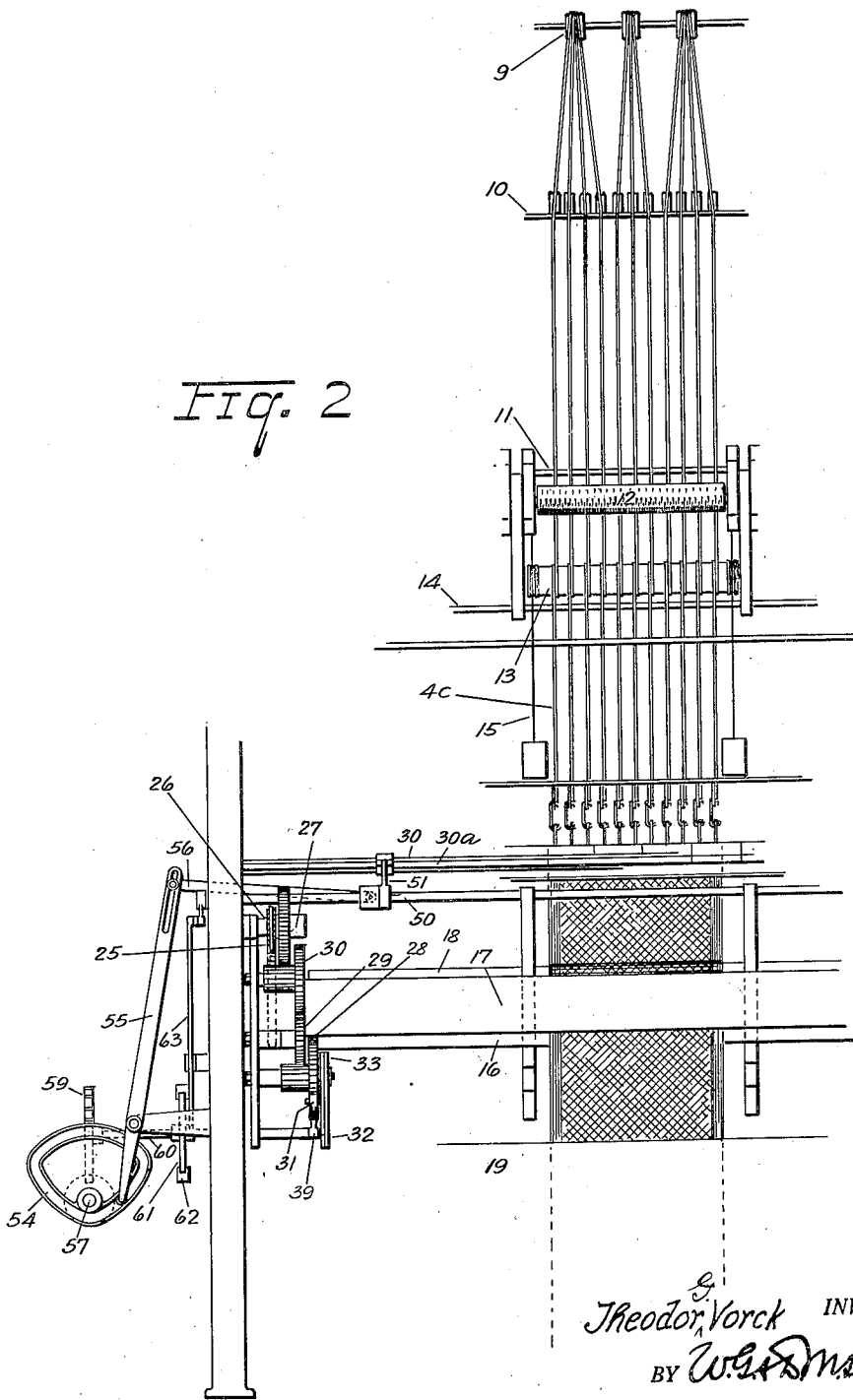
1,706,426

WARP KNITTING MACHINE

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Fig. 2



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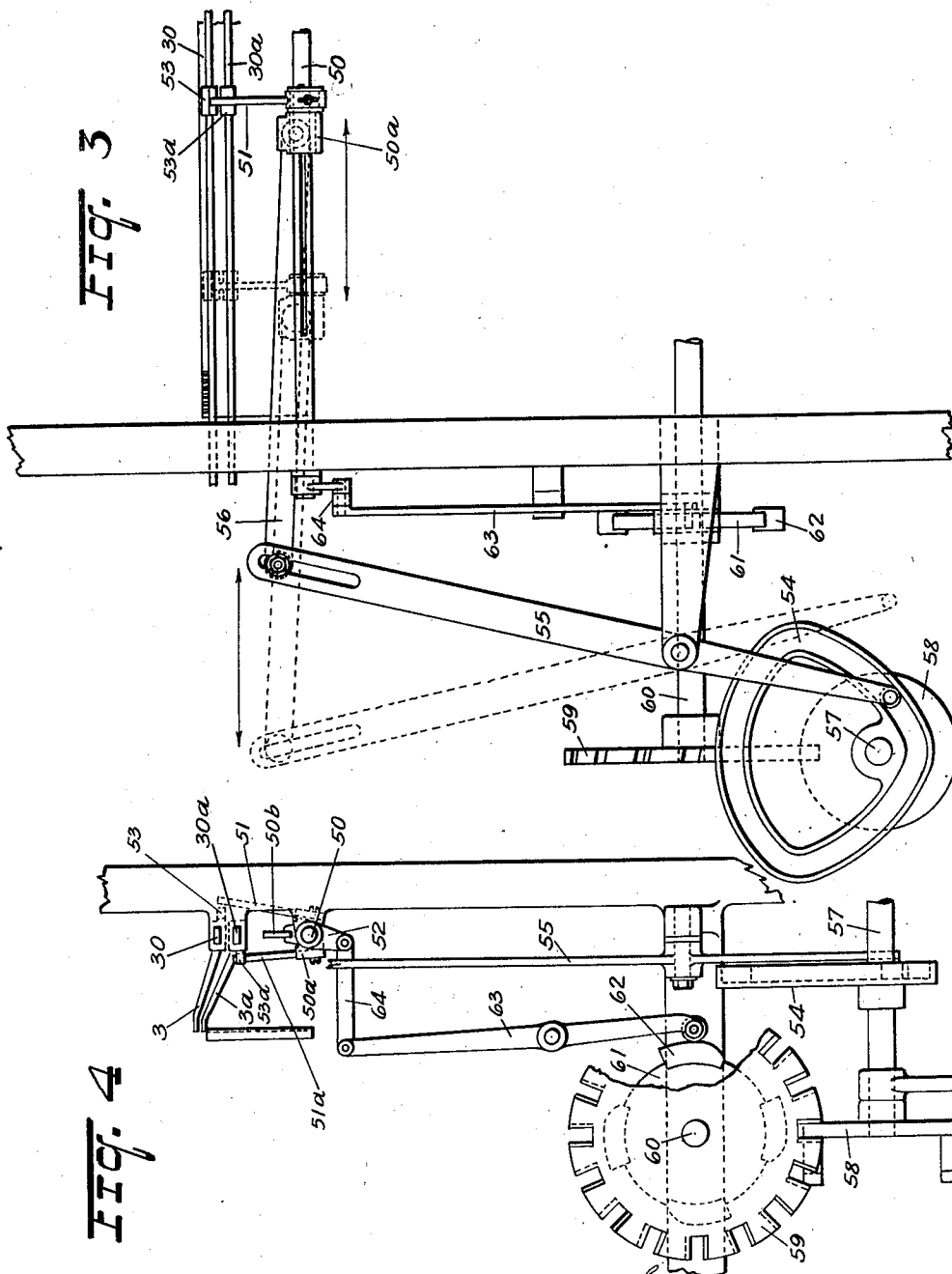
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1,706,426

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FIG. 3



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Patented Mar. 26, 1929.

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UNITED STATES PATENT OFFICE.

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WARP KNITTING MACHINE.

Application filed June 21, 1927. Serial No. 200,461.

This invention relates to the so-called Raschel type of warp knitting machine, in which a straight bank of vertically reciprocated needles is employed, in connection with a plurality of warp-thread guides for each needle which are actuated to jointly carry their threads through the needles; longitudinal series of said guides having independent pattern movement lengthwise of the needle bank so that determined warp threads may be wrapped about their own or adjacent needles on either side and interlooped by the needles with previously formed loops to produce a fabric. The invention consists in improvements in this type of machine whereby it is adapted to satisfactorily produce such fabric as is shown and described in my co-pending application Serial No. 68,493, filed November 12, 1925; and more particularly, first, in novel tensioning means for the elastic warp threads specifically employed, and for the take-off of the knitted fabrics; and second in the provision of variable weft thread mechanism, whereby such improved fabric is produced in a commercially successful manner with desired pattern effects; as fully set forth in the following specification in connection with the accompanying drawings, the novel features being clearly defined in the appended claims.

Fig. 1 is a diagrammatic side elevation indicating essential parts of such known warp knitting machine, with my improvements applied thereto.

Fig. 2 is a corresponding front elevation, a portion only of one end of the machine being indicated.

Fig. 3 is a partial plan view showing my improved weft thread guide mechanism; and

Fig. 4 is a corresponding side elevation of the latter.

Parallel series of warp-thread guides, 2, 2^a, 2^b, 2^c, are jointly operative crosswise of the bank of needles 1 so that the threads of transversely alined groups of guides 2, 2^a, 2^b, 2^c may be simultaneously passed between the needles; and by imparting pattern controlled longitudinal movement to determined series of guides after their threads have been passed between the needles, such threads are laid in the hooks of the needles as desired. The warp threads for the several series of guides 2, 2^a, 2^b, 2^c are supplied from suitable reels 20, 20^a, 20^b, 20^c; the latter, as indi-

cated, supplying the elastic warp threads 4^c to all of the longitudinal series of guides 2^c, and special tensioning mechanism as hereinafter described provided both for these feeding threads 4^c and for the taking off of the knitted fabric, to insure production of a uniformly knitted and satisfactorily flat product; special weft guide mechanism being also provided as will be fully set forth.

The employment of rubber warp threads 4^c in connection with knitting mechanism such as above described, commonly results in the production of an objectionably distorted fabric because of difficulty in properly controlling the tensioning thereof in accord with the relatively inelastic threads employed. To provide for securing proper feeding of such elastic threads to the knitting point, I provide special tensioning means therefor in connection with heretofore used guide rollers such as are indicated in Fig. 1 at 5, 6, 7, 8, and 9, over which rollers the threads 4^c are led to the usual separating comb 10 with suitable tensioning weights bearing thereon; such special tensioning means, located below the comb 10, comprising a fixed rod 11 and a freely rotated roughened roller 12, which successively deflect the threads; a grooved roller 13 around which the threads are turned and which is provided with a determinedly variable brake; and a second fixed deflecting rod 14, below the interposed rolls 12, 13 and over which the threads pass to their respective guides 2^c. The roughened surface of roller 12 insures equalized delivery of the passing threads to the grooved roll 13, around which latter a single convolution of each thread is made and from which it is delivered over the deflecting rod 14 under the uniform braking action of the determinedly weighted brake cord 15; so that all of the evenly stretched threads are uniformly presented to the action of the needles.

Supplementing this special tensioning mechanism for the feeding elastic warps, I also provide a take-off mechanism below the bank of needles 1, whereby equalized tensioning of the elastic threads 4^c is maintained after they are interengaged with the other warp threads and with any weft threads employed, as hereinafter specifically described; such take-off mechanism compris-

ing particularly a pair of axially supported rollers 16 and 17, and a free roller 18 pressing thereon; the knitted fabric passing part way around roller 16, over roller 18, and under roller 17 to a basket 19 or other receiver as desired. Roller 16 is driven by a chain or belt 25, from a gear driven shaft 26 the gear 27 of which is actuated from a ratchet-driven gear 28 through intermediate gears 29, 30. As shown, the ratchet pawl 31 for gear 28 is carried by a lever 32 radially swingable about said gear 28; and an actuating intermediately pivoted lever 33 is oscillated by a pitman 34 from a power driven cam 35, and a link 36 engaged in spaced holes 37 and 38 in levers 32 and 33 respectively, adjustably connects said levers 32 and 33 to provide a determined intermittent rotation of roller 16. A pawl 39 prevents reverse turning movement of ratchet wheel 28, and the intermediate gears 29 and 30 may be changed so that their ratio of drive to gear 27 may be very delicately adjusted in connection with adjustment of strap 36 in one or another of holes 37 and 38.

With the mechanism thus fully described I am able to maintain necessary equalized tensioning of the warp 4^a above the bank of needles 1 and of the fabric engaged warps below said bank of needles, so that the resultant fabric will retract equally when free of the take-off rolls 16, 18 and 17, and produce a flat-lying fabric of equal stretch throughout.

In order to retain a fixed width of the fabric, which is necessarily made up of elongated loops formed on the stretched warps 4^a that are loosened by the retraction of said warps, I introduce weft threads 40 and 41 by means of guides 3 and 3^a which are arranged, as shown, to reciprocally move lengthwise of the bank of needles 1. These guides 3 and 3^a are carried by rolls or bars 30 and 30^a respectively, actuated to reciprocate along the length of the bank of needles 1 through a parallel bar 50, which may be selectively engaged by either bar 30 or 30^a through arms 51 or 51^a respectively. The arms 51 and 51^a are both fastened to a clamp 50^a, which is securely held to reciprocating shaft 50 and they are selectively brought into engagement with dogs 53 and 53^a on bars 30 and 30^a respectively. Bar 50 is reciprocated by a cam 54 through an intermediately pivoted lever 55, partly broken away in Fig. 4 to show arms 51 and 51^a more clearly. One end of lever 55 engages in a cam path of said cam, the other end being connected by a link 56 to bar 50, by means of a clamp 50^a which is prevented from turning with shaft 50 by a lock bar 50^b, the latter engaging with a slot provided for this purpose in clamp 51^a. Cam 54 is mounted on a shaft 57 which carries a gear 58 engaging with a

gear 59 on a driven shaft 60. Shaft 60 also carries a disc 61 having cam lugs 62 arranged to oscillate an intermediately pivoted lever 63, one end of which is connected by a link 64 with arm 52 to swing arms 51 and 51^a into and out of engagement with dogs 53 on bars 30 and 30^a. By proper shaping and timing of cam 54, the shaft 50 is constantly reciprocated along the bank of needles 1 for each course of the fabric, or definite course desired, and by proper location of cam lug 62, the weft guides 3 and 3^a are selectively reciprocated with shaft 50 to lay a partial length weft, or wefts. By using colors in the wefts, pleasing pattern effects may be introduced into the fabric in connection with varying colors of the warp threads, or without the latter; and the use of such weft threads increases the resistance of the finished fabric to width stretching, with reinforced resistance wherever guides 3 or 3^a lay an additional weft thread, while neither of such wefts reduces in the least the free stretch of the fabric lengthwise.

My improvements thus fully described, provide in a simple satisfactory and economical manner for the production of the novel fabric of my aforesaid co-pending application or variations thereof, and insure its satisfactory and commercially successful production at small cost and with large output.

What I claim is:—

1. In a warp knitting machine having a bank of vertically reciprocated needles, and parallel series of warp-thread guides independently adjustable longitudinally and jointly operative crosswise of the needle bank; warp-thread tensioning mechanism arranged to operate only upon the threads leading to one of said parallel series of guides and comprising a pair of spaced-apart friction rods and a cooperating pair of friction rollers, over which said threads are passed, one of said rollers being provided with braking means.

2. In a warp knitting machine having a bank of vertically reciprocated needles, and parallel series of warp-thread guides independently adjustable longitudinally and jointly operative cross-wise of the needle bank; warp-thread tensioning mechanism arranged to operate only upon the threads leading to one of said parallel series of guides; and fabric take-off mechanism comprising a pair of take-off rollers one of which is driven, and a free presser roller supported by said take-off rollers; whereby equalized tensioning of said determined warp threads may be maintained above and below the knitting needles.

3. In a warp knitting machine having a bank of vertically reciprocated needles, and parallel series of warp-thread guides in-

dependently adjustable longitudinally and jointly operative cross-wise of the needle bank; warp-thread tensioning mechanism arranged to operate only upon the threads leading to one of said parallel series of guides; a plurality of longitudinally movable weft guides having means for automatically moving the same selectively to determinedly engage their threads; and a series of three fabric take-off rollers one of which is adjustably driven and another of which is freely supported upon the other two.

In testimony whereof I affix my signature.

THEODOR G. VORCK.