Feb. 6, 1951

F. LAMBACH

2,540,128

WARP KNITTING MACHINE

Filed Dec. 8, 1945

5 Sheets-Sheet 1

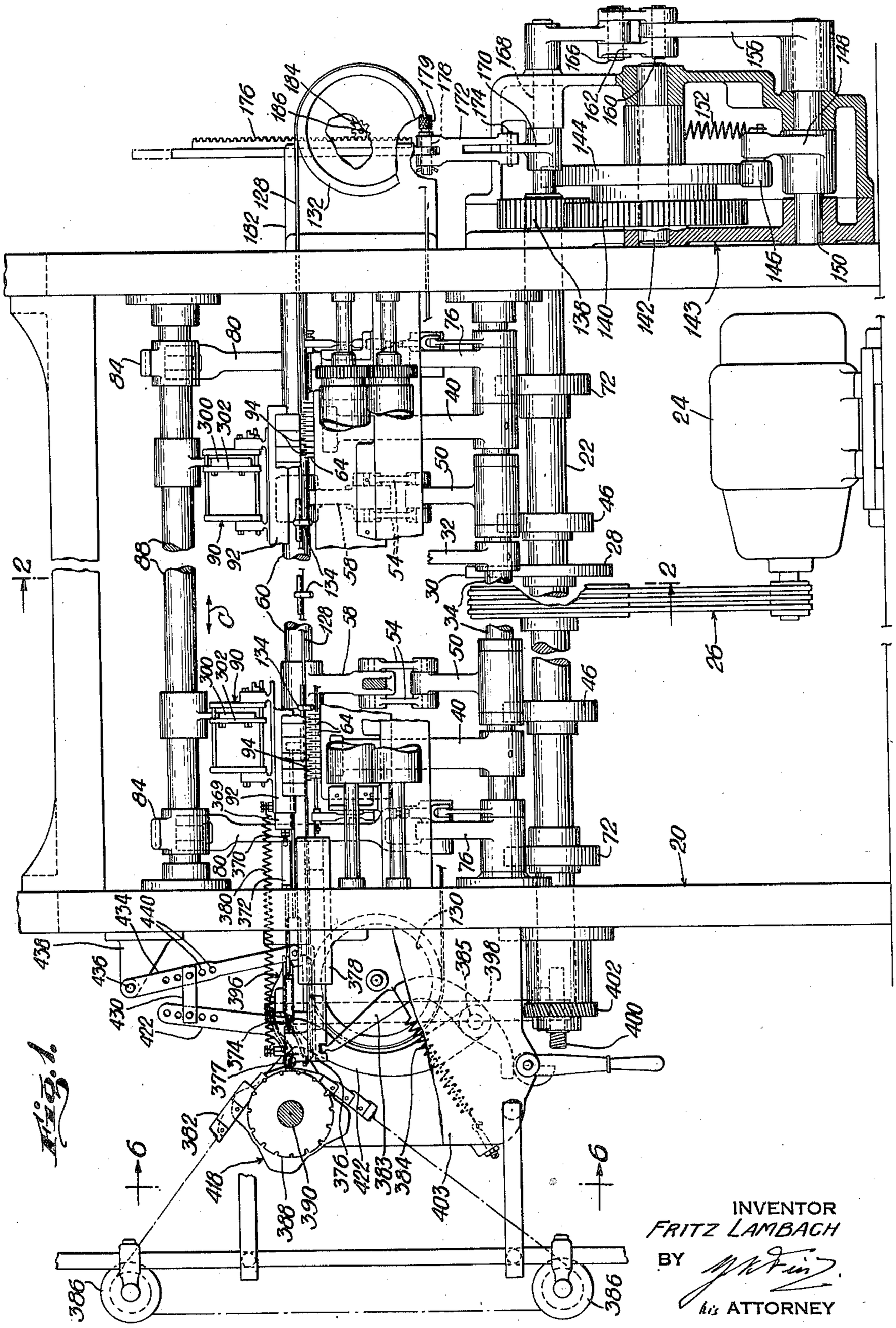

Fig. 1.

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Fig. 2.

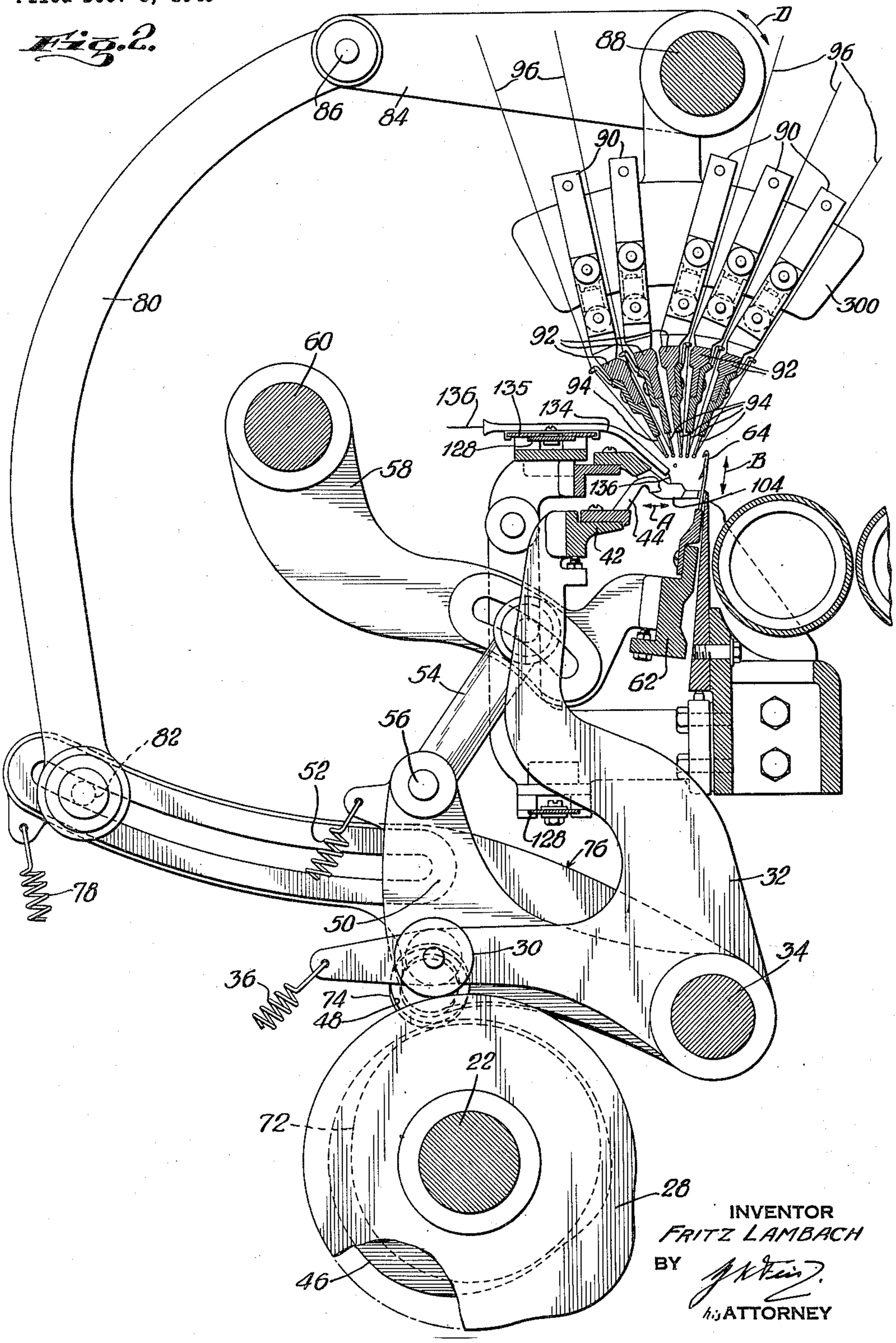

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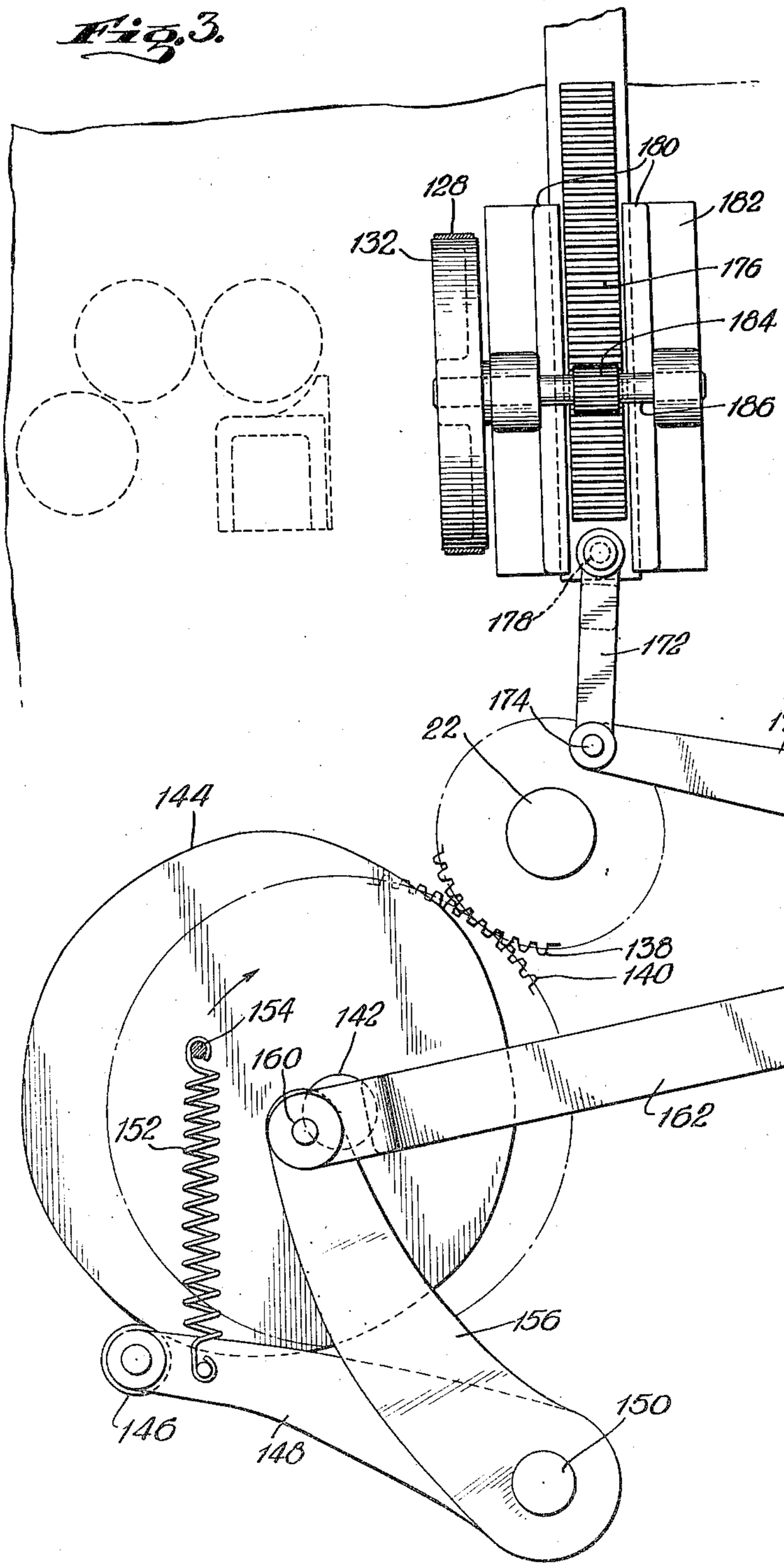
Fig. 3.



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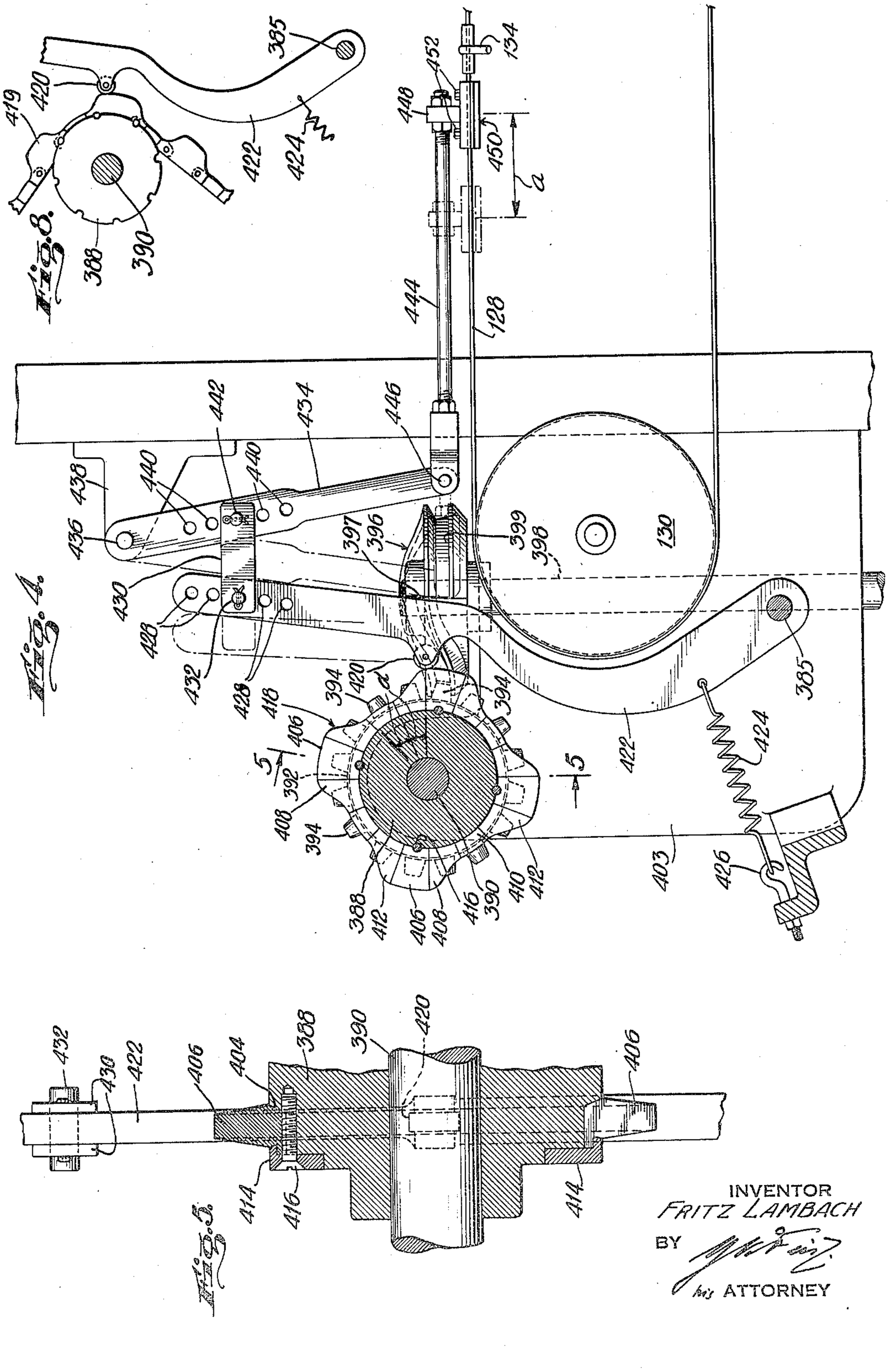

Fig. 4.

Fig. 5.

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Fig. 6.

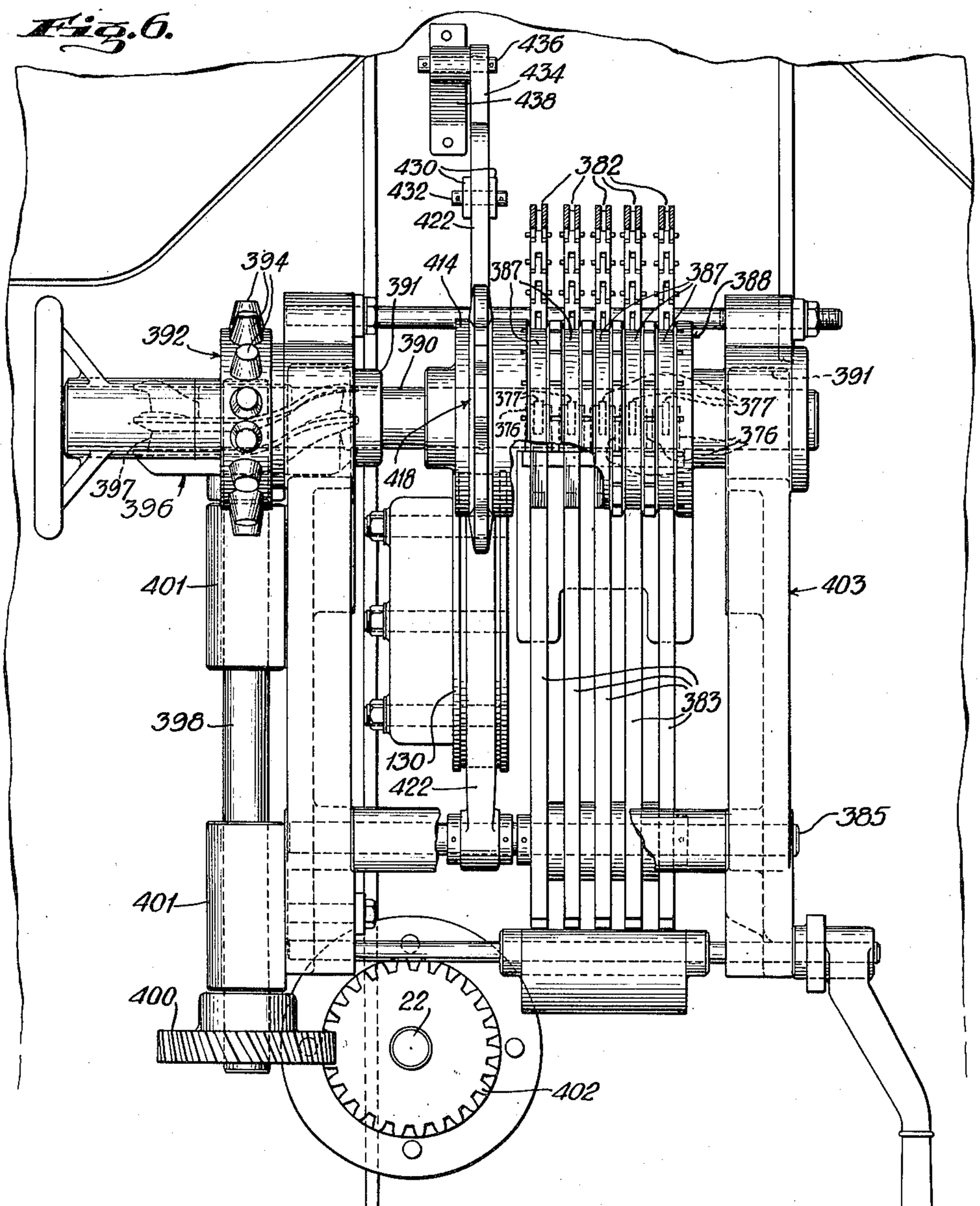
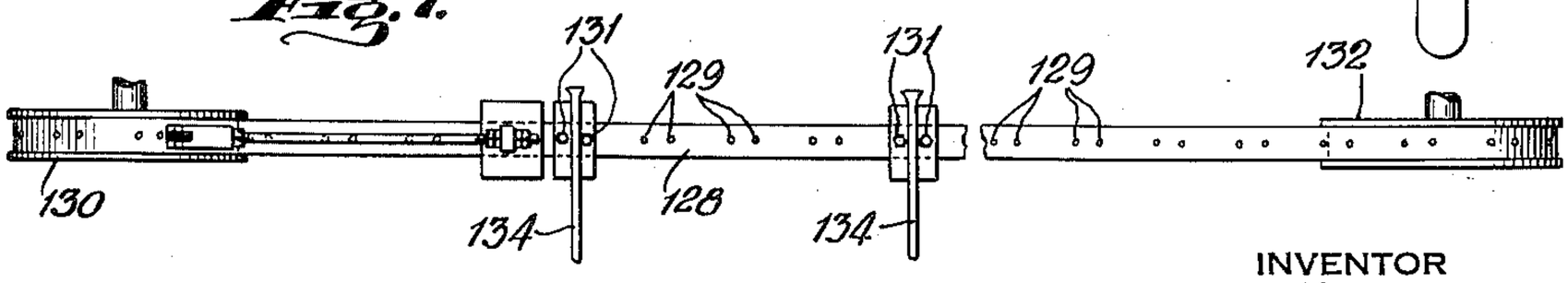


Fig. 7.



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Patented Feb. 6, 1951 2,540,128

UNITED STATES PATENT OFFICE

2,540,128

WARP KNITTING MACHINE

Fritz Lambach, Tenafly, N. J., assignor to Robert Reiner, Inc., Weehawken, N. J.

Application December 8, 1945, Serial No. 633,692

23 Claims. (Cl. 66—84)

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My invention relates to textile machines, and more particularly to warp knitting machines or so-called "Kayloom machines," wherein one or more filler thread carriers are mounted on a reciprocable flexible transmission means, such as a band for example, for laying filler thread adjacent a series of needles for subsequent incorporation into fabric produced by the knitting implements of the machine from warp yarns drawn from warp beams.

An object of the present invention is to provide a warp knitting machine of above described type with a filler thread carrier drive for actuating such a flexible transmission means, which may be readily adjusted in such a way, that filler thread is laid by the filler thread carrier at regular or irregular intervals or alternatively at regular and irregular intervals so as to obtain any desired pattern of the fabric produced by the machine.

Another object of the present invention is to provide a warp knitting machine of above described type with a filler thread carrier drive for actuating such a flexible transmission means, which may be readily adjusted for imparting strokes of various length to the filler thread carrier.

A further object of the present invention is to provide a filler thread carrier drive of advantageous construction with rather light means to be accelerated for imparting small strokes to the filler thread carrier or carriers.

Still another object of the present invention is to provide a warp knitting machine of above described type with a first or main filler thread carrier drive for imparting periodic movements to the reciprocable flexible transmission means when the filler thread carrier mounted thereon shall be reciprocated over substantially the entire length of the series of needles of the machine, and with a second or additional filler thread carrier drive for imparting periodic movements to the reciprocable flexible transmission means when the filler thread carrier or carriers mounted thereon shall be reciprocated over a fraction of the length of the series of needles of the machine.

A further object of the present invention is to provide such an additional filler thread carrier drive, which may be readily attached to a warp knitting machine of above described type.

Another object of the present invention is to improve on the construction of warp knitting machines of above described type as now ordinarily made.

My invention consists in certain novel features

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of construction of my improvements as will be hereinafter fully described.

The above mentioned objects and advantages as well as other objects and advantages will be more fully described in the following specification, reference being had to the accompanying drawings forming part of this specification, wherein:

Fig. 1 is a front elevational view of a warp knitting machine according to the invention, some parts being broken away and some parts being shown in section,

Fig. 2 is a vertical sectional view of the warp knitting machine, taken on line 2—2 of Fig. 1,

Fig. 3 is a fragmentary right-hand side elevational view of the warp knitting machine, illustrating the main filler thread carrier drive for the actuation of the filler thread carrier when the latter shall be reciprocated over substantially the entire length of the series of needles of the machine,

Fig. 4 is a fragmentary front elevational view of the additional filler thread carrier drive including a pattern mechanism for the actuation of the filler thread carrier or carriers when the latter shall be reciprocated over a fraction of the length of the series of needles of the machine,

Fig. 5 is a sectional view of the drum carrying a series of pattern elements actuating the mechanism of the additional filler thread carrier drive, taken on line 5—5 of Fig. 4,

Fig. 6 is a sectional view taken on line 6—6 of Fig. 1,

Fig. 7 is a top plan view of the flexible band supporting the filler thread carriers, and

Fig. 8 illustrates a different embodiment of the pattern mechanism for the additional filler thread carrier drive in the shape of a pattern chain drive.

Referring now to Figs. 1 and 2, 20 generally indicates the frame of the warp knitting machine composed of several parts in a suitable manner. A main cam shaft 22 journalled in suitable bearing of the frame may be rotated by a motor 24 connected with said main cam shaft through a belt drive generally indicated by 26.

Several sinker bar cams 28 (only one being shown in the drawings) are keyed to the main cam shaft 22. Each of said sinker bar cams 28 is in operative engagement with a roller 30 rotatably mounted on a sinker bar rocker 32 keyed to a sinker bar shaft 34 rotatably mounted in suitable bearings of the frame. A tension spring 36 stretched between one end of said sinker bar rocker 32 and a stationary point of the machine tends to urge the roller 30 against

the surface of the sinker bar cam 28. The other end of said sinker bar rocker 32 and the free end of a plurality of sinker bar arms 40 keyed to the sinker bar shaft 34 carry a sinker bar 42 secured to said ends of the sinker bar rocker and sinker bar arms by screws. The sinker bar 42 extending over the width of the warp knitting machine carries a series of filler sinkers 44 secured thereto in any suitable manner. Above described sinker bar drive 28, 30, 32, 34 associated with said sinker bar 42 may reciprocate the sinker bar 42 with its filler sinkers 44 in a forward and backward direction A in dependence on the shape of the sinker bar cam 28.

Furthermore, several needles bar cams 46 are keyed to the main cam shaft 22. Each of said needle bar cams cooperates with a roller 48 journalled on a needle bar rocker 50 swingably mounted on the sinker bar shaft 34. A tension spring 52 stretched between the needle bar rocker 50 and a stationary point of the machine tends to urge the roller 48 against the surface of the needle bar cam 46. On each side of the needle bar rocker 50, one end of a connecting link 54 is pivoted to the needle bar rocker 50 at 56. The other end of said connecting link 54 is pivotally and adjustably connected with a needle bar arm 58 keyed to a needle bar shaft 60 rotatably mounted in suitable bearings of the frame 20. A needle bar 62 carrying a series of needles 64 and extending over the width of the machine is secured to the needle bar arms 58 by screws. Above described needle bar drive 46, 48, 50, 54, 58 associated with the needle bar 62 may reciprocate said needle bar 62 with its needles 64 in an upward and downward direction B in dependence on the shape of the needle bar cam 46.

Furthermore, several guide bar cams 72 are keyed to the main cam shaft 22. Each of said guide bar cams cooperates with a roller rotatably mounted on a guide bar rocker 76 swingably mounted on the sinker bar shaft 34. A tension spring 78 stretched between the guide bar rocker 76 and a stationary point of the machine tends to urge the roller 74 against the surface of the guide bar cam 72. One end of a connecting link 80 is pivotally and adjustably connected with the guide bar rocker 76 at 82, the other end of said connecting link 80 is pivoted to one end of a guide bar arm 84 at 86. The other end of said guide bar arm 84 is keyed to a guide bar shaft 88 rotatably mounted in suitable bearings of the frame 20. A series of spaced brackets 300 is keyed to said guide bar shaft 88. Five supporting elements 302 (only one being shown in Fig. 1) are screwed to each of said brackets 300. A mounting structure generally indicated by 90 is slidably arranged in each of said supporting elements 302 for reciprocating movements in the direction C of the longitudinal axis of the machine. Reference is also had to my copending patent application relating to "A Structure for Suspending a Guide Bar From a Bracket of a Warp Knitting Machine," Serial #632,014, filed November 30, 1945, now Patent No. 2,428,030. The machine comprises five guide bars 92, extending longitudinally of the machine, each of them being secured to a series of said mounting structures 90 in a row extending longitudinally of the machine. Each guide bar 92 carries a series of warp guides 94, by means of which warp yarns 96 drawn from rotatable warp beams (not shown) are fed to the needles 64. Above described guide bar drives 72, 74, 76, 80 84 associated with the guide bar shaft 88 may

impart periodic rocking movements in the direction of the arrow D to said guide bar shaft and the guide bars 92 with their warp guides 94 in dependence on the shape of the guide bar cam 72.

As mentioned above, the mounting structures 90, and of course the guide bars 92 connected therewith, may be reciprocated in the direction of the arrow C. The drive for imparting periodic shifting movements in the direction of the arrow C to the guide bars 92 and the warp guides 94 is as follows:

A helical gear 402 (see Figs. 1 and 6) keyed to the main cam shaft 22 is in mesh with a helical gear 400 keyed to the lower end of vertical shaft 498 journalled in suitable bearings 401 of a support 403 secured to the frame 20 of the machine. A cam gear 396 (see Figs. 1 and 4) is keyed to the upper end of said vertical shaft 398. Said cam gear 396 has two grooves 397 and 399, and each of said grooves has two substantially horizontal sections connected with each other by an inclined section. Each groove extends through substantially one-half of the circumference of the cam gear 396. The grooves 397 and 399 of the cam gear 396 are arranged for engagement with pins 394 of a pin gear 392 keyed to a horizontal shaft 390 journalled in suitable bearings 391 of the support 403. A drum 388 having five circular grooves 387 is keyed to the shaft 390. Five pattern chains 382 engaged with said grooves 387 are trained around said drum 388 and idle rollers 386. The machine comprises five carriages 376 (only one being shown in Fig. 1) slidably arranged for reciprocating movements in guides 378 mounted on the frame 20. Each carriage 376 is provided with a roller 377 for engagement with the elements of the pattern chain 382. A spring 384 acting on a lever 383 swingably mounted on the support 403 at 385 and engaged with the carriage 376 tends to urge the roller 377 against the pattern chain 382. Each carriage 376 is provided with an element 374 detachably mounted on said carriage. Said element 374 has a spherical portion in movable engagement with a spherical recess at one end of an adjustable connecting rod 372. A spherical recess at the other end of said connecting rod 372 is in engagement with a spherical portion of an element 370 detachably connected with a member 369 secured to the left-hand end of the mounting structure 90 arranged at the left-hand end of the machine. A spring 380 stretched between the carriage 376 and said mounting structure 90 tends to hold the connecting rod 372 in engagement with the spherical members 370 and 374. When the pattern chains 382 are advanced, the guide bars 92 secured to the structures 90 are shifted to the right (as viewed in Fig. 1) and to the left in the direction of the arrow C by means of the connecting rods 372 in dependence on the shape of the elements of the pattern chains 382. The ratio of the helical gears 400, 402 and the shape and arrangement of the grooves 397, 399 in the cam gear 396 is such, that the pin gear 392 and the drum 388 keyed to the shaft 390 carrying said pin gear are moved intermittently in two steps through two angles, each angle corresponding to the distance between two pins or one pitch, during one revolution of the main cam shaft. During the first step, the guide bar 92 with its guides 94 is shifted in one direction, and during the second step the guide bar 92 with its guides 94 is shifted in the opposite direction.

As best shown in Fig. 1, an endless band 128

of flexible material is trained around two drums 130, 132, each of said drums is journaled in suitable bearings of brackets mounted on the frame 20. The drum 132 is connected with the main filler thread carrier drive, to be described hereinafter, by means of which the drum 132 may be periodically rotated in clockwise direction or counter-clockwise direction, whereby a periodic reciprocating movement is imparted to the band 128 with a stroke substantially corresponding to the entire width of the machine. As best shown in Fig. 7, said band 128 is provided with a series of holes 129. One or more filler threads carriers generally indicated by 134 may be selectively fixed at suitable places to said flexible band 128 by means of screws 131 or the like inserted into holes of the band. The filler thread carrier or carriers may slide on a guide 135 (Fig. 2) mounted on the frame of the machine. Each of the filler thread carriers 134 mounted on the band 128 receives filler thread 136 from a filler thread supply (not shown). When the filler thread carrier or carriers 134 are moved from one end position into another end position in the direction of the longitudinal axis of the machine, filler thread is laid by said filler thread carrier or carriers substantially parallel to the series of needles 64 onto a bridge formed by stationary elements 104, which may be called stationary filler thread receiving elements.

The main filler thread carrier drive associated with the band 128 for reciprocating same and a filler thread carrier 134 mounted thereon throughout a stroke substantially corresponding to the entire width of the machine is best shown in Figs. 1 and 3. A pinion 138 keyed to the end of the main cam shaft 22 is in mesh with a gear 140 keyed to a shaft 142 journalled in suitable bearings of a support 143 mounted on the frame 20. A cam 144 keyed to said shaft 142 is in engagement with a roller 146 rotatably mounted on a rocker 148 keyed to a shaft 150 journalled in bearings of the support 143. A tension spring 152 stretched between the rocker 148 and a stationary stud 154 of the machine tends to urge the roller 146 against the surface of the cam 144. An arm 156 keyed to the shaft 150 is pivoted at 160 to one forked end of a connecting link 162, the other forked end of which is pivoted at 166 to one end of an arm 164. The other end of said arm 164 is keyed to a shaft 168 journalled in bearings of the support 143. The end of an arm 170 keyed to said shaft 168 is pivoted to one end of a connecting rod 172 at 174. The other end of said connecting rod 172 is pivotally connected with the lower end of a rack 176 by means of a pin 178. Said pin 178 is held in its position by means of a nut 179 and may be removed after an unscrewing of said nut 179 for a disengagement of said connecting rod 172 from said rack 176 for a purpose to be described hereinafter. Said rack 176 is slidably arranged in a guide 180 mounted on a bracket 182 of the machine. A pinion 184 in mesh with said rack 176 is keyed to a shaft 186 journalled in bearings of the bracket 182. The drum 132 engaged with a band 128 is keyed to the shaft 186. As will be readily understood, above described main filler thread carrier drive 138, 140, 144, 148, 156, 162, 164, 170, 172, 176, 184, 132, may cause a movement of the band 128 with a filler thread carrier mounted thereon to the right or to the left, depending on the upward or downward movement of the rack 176 in dependence on the shape of the cam 144. The ratio between the pinion 138 and the gear 140 is 1:2, and the cam 144 is of such a shape, that the filler thread carrier 134 fixed to the band 128 preforms either one movement to the right from its extreme left-hand position into its extreme right-hand position (i. e. a stroke substantially corresponding to the entire length of the series of needles 64 of the machine) with a subsequent stand-still in its extreme right-hand position, or one movement to the left from its extreme right-hand position into its extreme left-hand position, (i. e. again a stroke substantially corresponding to the entire length of the series of needles 64 of the machine) with a subsequent standstill in its extreme left-hand position during one full rotation of the main cam shaft 22 corresponding to one cycle of knitting operations. As will be readily understood, when above described main filler thread carrier drive is used for reciprocating the band 128, the filler thread carrier mounted on the band performs a stroke substantially corresponding to the length of the series of needles of the machine, whereby filler thread is laid adjacent the series of needles substantially along the entire length of said series of needles. Said main filler thread carrier drive is used, when it is desired to manufacture a wide piece of fabric.

If it is desired to knit simultaneously a plurality of narrow fabrics, ribbons, or the like, above described main filler thread carrier drive is disengaged from the rack 176 by removing the pin 178, and furthermore the spring 152 may be disengaged from the stud 154, whereupon the additional filler thread carrier drive to be described hereinafter may be connected with the band 128 for reciprocating same with a plurality of filler thread carriers 134 mounted thereon through strokes corresponding to a fraction of the length of the series of needles of the machine.

As best shown in Figs. 4–6 the drum 388 driving the pattern chain 382 has a sixth groove 404 receiving a plurality of cam-like pattern elements or cam bits 406, 408, 410, 412 held in their position by means of a ring 414 attached to the drum 388 by means of screws 416. The holding ring 414 is engaged with recesses at the roots of the cam-like pattern elements or cam bits 406—412. Said cam-like pattern elements 406—412 form a pattern cam generally indicated by 418 having fourth high portions and four low portions, each of them having a dwell. The use of the detachable ring 414 permits a ready exchange of the cam-like pattern elements 406—412, if a pattern cam 418 of different shape is desired for a different operation of the machine. A roller 420 journalled on an intermediate point of a rocking lever 422 swingably mounted on the shaft 385 is held in engagement with the surface of said pattern cam 418 by means of a spring 424 stretched between said rocking lever 422 and a stationary hook 426. The upper end of said rocking lever 422 is provided with a series of holes 428. One end of a connecting rod 430 may be pivoted with the upper end of said rocking lever 422 by means of a pin 432 selectively engaged with one of said holes 428. A rocking arm 434 swingably mounted at 436 on a bracket 438 secured to the frame 20 of the machine is provided with a series of holes 440. The other end of said connecting rod 430 may be pivotally connected with said rocking arm 434 by a selective engagement of a pivot 442 with one of said holes 440. The lower end of the rocking arm 434 is pivoted to one end of an actuating rod 444 of adjustable length by means of a pin

446, which is disengageable for a purpose to be described hereinafter. The other end of said actuating rod 444 is connected with an extension 448 of a connecting element generally indicated by 450. Said connecting element may be attached to the band 128 by means of screws 452 passing through holes of the band 128.

As mentioned above, during one revolution of the main cam shaft, the pin gear 392 having sixteen pins 394 is rotated intermittently in two steps through two angles, each angle corresponding to the distance between two pins. Consequently, the drum 388 carrying sixteen pattern elements 406—412 is rotated during such a revolution of the main cam shaft corresponding to one cycle of knitting operations through two angles α corresponding to the circumferential length of two pattern elements. Therefore, in accordance with the shape of such two adjacent pattern elements, the filler thread carriers 134 mounted on the band 128 perform either one movement to the left with a subsequent standstill in their left-hand end position or one movement to the right with a subsequent standstill in their right-hand end position during one full rotation of the main cam shaft 22 corresponding to one cycle of knitting operations. The length of the stroke of the filler thread carriers 134 equals to the length of the stroke a of the connecting element 540, which is only a fraction of the length of the series of needles of the machine. The length of said stroke a may be readily adjusted by inserting the pin 432 and/or 442 into a different hole of the rocking lever 422 and/or rocking arm 434. Thus, when above described additional filler thread carrier drive is used for reciprocating the band 128, the filler thread carriers attached to said band lay filler thread adjacent the series of needles along a fraction of the length of said series of needles.

According to the embodiment shown in Fig. 4, the exchangeable cam-like pattern elements 406—412 are chosen in such a way, that the pattern cam 418 formed by said pattern elements is of regular and symmetrical shape, so that, as described above, filler thread is laid at regular intervals during the knitting of each row of stitches, and so that each time filler thread is laid along the same fraction of the length of the series of needles. If it is desired to have filler thread laid at irregular intervals, so that, for example, filler thread is laid only during the knitting of three consecutive rows of stitches and is not laid during the knitting of the next row of stitches, such an operation of the warp knitting machine may be readily obtained by replacing some of the pattern elements by pattern elements of different shape. Furthermore, if it is desired to have filler thread laid at regular or irregular intervals along different fractions of the length of the series of needles, such an operation of the warp knitting machine may be readily obtained by replacing some of the pattern elements by pattern elements of different heights.

A still greater variety of patterns of the fabric produced by the warp knitting machine may be obtained, if the cam-like pattern elements 406—412 are replaced by a pattern chain 419 laid around the drum 388 as shown in Fig. 8.

If it is desired to use the main filler thread carrier drive for a certain operation of the machine, the additional filler thread carrier drive may be readily disengaged from the band 128 by disconnecting the connecting element 450 (Fig. 4) from the band and by removing the pin 446

for disengaging the actuating rod 444 from the rocking arm 434.

The warp knitting machine shown in the drawings is equipped with a main filler thread carrier drive for the manufacture of wide pieces of fabric and with an additional filler thread carrier drive for the manufacture of narrow pieces of fabric. It is understood, that said main filler thread carrier drive may be entirely omitted, if the warp knitting machine is to be used only for the manufacture of narrow pieces of fabric such as ribbons or the like.

Furthermore, instead of the band 128 shown in the drawings other flexible transmission means, such as a chain or the like, may be used, if desired.

Moreover, the warp knitting machine shown in the drawings is equipped with an intermittent drive, i. e. the cam gear 396 and the pin gear 392, for the actuation of the pattern chains 382 and the pattern cam 418 or pattern chain 419. It is understood, that said intermittent drive may be replaced by a continuous drive, for example two helical gears in mesh with each other, if desired.

Furthermore, the filler thread carrier drive actuated by a pattern mechanism 418 or 419 according to the invention, may also be applied to warp knitting machines having two series of needles instead of one as shown in the drawings.

I have described preferred embodiments of my invention, but it is understood that this disclosure is for the purpose of illustration and that various omissions or changes in shape, proportion, or arrangement in parts as well as the substitution of equivalent elements for those herein shown or described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a rotatable drum, a drive for rotating said drum, a pattern chain laid around said drum, and transmission actuating means arranged for actuation by said pattern chain and associated with said flexible transmission means for imparting periodic strokes to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles.

2. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, main filler thread carrier actuating means, a drive for driving said main filler thread carrier actuating means, said main filler thread carrier actuating means being associated with said flexible transmission means and being constructed for imparting periodic strokes of a length substantially corresponding to the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles substantially along the entire length thereof, additional filler thread carrier actuating means, and

a drive for driving said additional filler thread carrier actuating means, said additional filler thread carrier actuating means being associated with said flexible transmission means and being constructed for imparting periodic strokes of a length corresponding to a fraction of the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles along a fraction of the length thereof, and at least one of said filler thread carrier actuating means being disengageable from said flexible transmission means.

3. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, main filler thread carrier actuating means, a drive for driving said main filler thread carrier actuating means, said main filler thread carrier actuating means being associated with said flexible transmission means and being constructed for imparting periodic strokes of a length substantially corresponding to the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles substantially along the entire length thereof, and additional filler thread carrier actuating means, said additional filler thread carrier actuating means including a pattern mechanism, a drive for actuating said pattern mechanism, and transmission actuating means arranged for actuation by said pattern mechanism and associated with said flexible transmission means, said additional filler thread carrier actuating means being constructed for imparting periodic strokes of a length corresponding to a fraction of the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles along a fraction of the length thereof, and at least one of said filler thread carrier actuating means being disengageable from said flexible transmission means.

4. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, at least one reciprocable guide bar carrying a series of warp guides, a first pattern mechanism, a drive for actuating said first pattern mechanism, said first pattern mechanism being associated with said guide bar for imparting periodic strokes to said guide bar so as to feed warp yarns to said needles, at least one filler thread carrier selectively fixable on said flexible transmission means, main filler thread carrier actuating means, a drive for driving said main filler thread carrier actuating means, said main filler thread carrier actuating means being associated with said flexible transmission means and being constructed for imparting periodic strokes of a length substantially corresponding to the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles substantially along the entire length thereof, and additional filler thread carrier actuating means, said additional filler thread carrier actuating means including a second pattern mechanism coupled with said first pattern mechanism and including transmission actuating means arranged for actuation by said

second pattern mechanism and associated with said flexible transmission means, said additional filler thread carrier actuating means being constructed for imparting periodic strokes of a length corresponding to a fraction of the length of the series of needles to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles along a fraction of the length thereof, and at least one of said filler thread carrier actuating means being disengageable from said flexible transmission means.

5. In a warp knitting machine as claimed in claim 3, said pattern mechanism including pattern elements exchangeably arranged in said pattern mechanism.

6. In a warp knitting machine as claimed in claim 3, said transmission actuating means including adjustable means for adjusting the length of the stroke of said flexible transmission means.

7. In a warp knitting machine as claimed in claim 3, said transmission actuating means being directly connected with said flexible transmission means.

8. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a pattern mechanism, a swingable rocking lever arranged for engagement with said pattern mechanism, a swingable rocking arm, a connecting rod pivotally connected with said rocking lever and said rocking arm, a reciprocable actuating rod, one end of said actuating rod being pivoted to said rocking arm, the other end of said actuating rod being arranged for attachment to said flexible transmission means, and a drive associated with said pattern mechanism for actuating the latter and imparting by the latter periodic strokes to said reciprocable actuating rod and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles.

9. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a pattern mechanism, a swingable rocking lever arranged for engagement with said pattern mechanism, a swingable rocking arm, a connecting rod pivotally connected with said rocking lever and said rocking arm, means whereby the effective length of said connecting rod may be adjusted, a reciprocable actuating rod, one end of said actuating rod being pivoted to said rocking arm, the other end of said actuating rod being arranged for attachment to said flexible transmission means, and a drive associated with said pattern mechanism for actuating the latter and imparting by the latter periodic strokes to said reciprocable actuating rod and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles.

10. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of

needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a rotatable element, a row of pattern elements mounted on the circumference of said rotatable element, said row of pattern elements being operatively associated with said reciprocable member, and a drive associated with said rotatable element for actuating the latter and imparting by the pattern elements mounted thereon periodic strokes to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles.

11. In a warp knitting machine as claimed in claim 10, said reciprocable member being disengageably attached to said flexible transmission means.

12. In a warp knitting machine as claimed in claim 10, adjusting means associated with said reciprocable member for adjusting the stroke thereof.

13. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a rotatable element, a row of pattern elements mounted on the circumference of said rotatable element, an adjustable linkage operatively engaged with said reciprocable member and operatively associated with said row of pattern elements, and a drive associted with said rotatable element for actuating the latter and imparting by the pattern elements mounted thereon periodic strokes through said linkage to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent to said series of needles.

14. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, means for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a rotatable element, a series of pattern elements exchangeably mounted on the circumference of said rotatable element, said row of pattern elements being operatively associated with said reciprocable member, and a drive associated with said rotatable element for actuating the latter and imparting by the pattern elements mounted thereon periodic strokes to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles.

15. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, at least one reciprocable guide bar carrying a series of warp guides for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a pattern mechanism having a plurality of rows of pattern

means, a row of pattern means being associated with said guide bar for imparting periodic strokes to said guide bar so as to feed warp yarns to said needles, another row of pattern means being associated with said reciprocable member for imparting periodic strokes to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles, and a drive associated with said pattern mechanism for actuating same.

16. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, at least one reciprocable guide bar carrying a series of warp guides for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a rotatable drum, at least one pattern chain laid around said drum, pattern cam means secured to said drum, said pattern chain being associated with said guide bar for imparting periodic strokes to said guide bar so as to feed warp yarns to said needles, said pattern cam means being associated with said reciprocable member for imparting periodic strokes to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles, and a drive associated with said rotatable drum for actuating same.

17. In a warp knitting machine: at least one series of needles extending longitudinally of the machine, at least one reciprocable guide bar carrying a series of warp guides for feeding warp yarns to said needles, reciprocable flexible transmission means extending substantially parallel to said series of needles, at least one filler thread carrier selectively fixable on said flexible transmission means, a reciprocable member attached to said flexible transmission means, a rotatable drum, a plurality of pattern chains laid around said drum, a pattern chain being associated with said guide bar for imparting periodic strokes to said guide bar so as to feed warp yarns to said needles, another pattern chain being associated with said reciprocable member for imparting periodic strokes to said reciprocable member and to said flexible transmission means with filler thread carrier mounted thereon so as to lay filler thread adjacent said series of needles, and a drive associated with said rotatable drum for actuating same.

18. An attachment for imparting periodic movements to a reciprocable flexible transmission means carrying at least one filler thread carrier for laying filler thread adjacent to a series of needles of a warp knitting machine, comprising an actuating member constructed for attachment to the reciprocable flexible transmission means of the warp knitting machine, an element constructed for connection with a drive of the warp knitting machine, and a row of pattern elements mounted on the circumference of said element, said row of pattern elements being associated with said actuating member for reciprocating same.

19. In an attachment as claimed in claim 18, an adjustable stroke setting mechanism interposed between said row of pattern elements and said reciprocable actuating member for adjusting the stroke of the latter.

20. An attachment for imparting periodic movements to a reciprocable flexible transmission means carrying at least one filler thread carrier for laying filler thread adjacent a series of needles of a warp knitting machine, comprising an actuating member constructed for attachment to the reciprocable flexible transmission means of the warp knitting machine, an element constructed for connection with a drive of the warp knitting machine, and a row of pattern elements exchangeably mounted on the circumference of said element, said row of pattern elements being associated with said actuating member for reciprocating same.

21. An attachment for imparting periodic movements to a reciprocable flexible transmission means carrying at least one filler thread carrier for laying filler thread adjacent a series of needles of a warp knitting machine, comprising an actuating member constructed for attachment to the reciprocable flexible transmission means of the warp knitting machine, and a pattern chain device constructed for connection with a drive of the warp knitting machine, said pattern chain drive being associated with said actuating member for reciprocating same.

22. In a pattern mechanism of a knitting machine a cam comprising: a main body having a circumferential groove, a series of separate cam bits exchangeably inserted into said groove at their roots, adjacent cam bits of said series of cam bits engaging each other, each of said cam bits having engaging means at its root, the main portion of each cam bit projecting outwardly from the circumference of said main body, and a holding member detachably mounted on said main body, said holding member being engaged with said engaging means of the cam bits so as to hold said cam bits in position.

23. In a pattern mechanism of a knitting machine a cam comprising: a main body having a circumferential groove, a series of separate cam bits exchangeably inserted into said groove at their roots, adjacent cam bits of said series of cam bits engaging each other, each of said cam bits having a recess at its root, the main portion of each cam bit projecting outwardly from the circumference of said main body, and an annular holding member detachably mounted on said main body, a portion of said holding member being engaged with said recesses of said cam bits so as to hold the latter in position.

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