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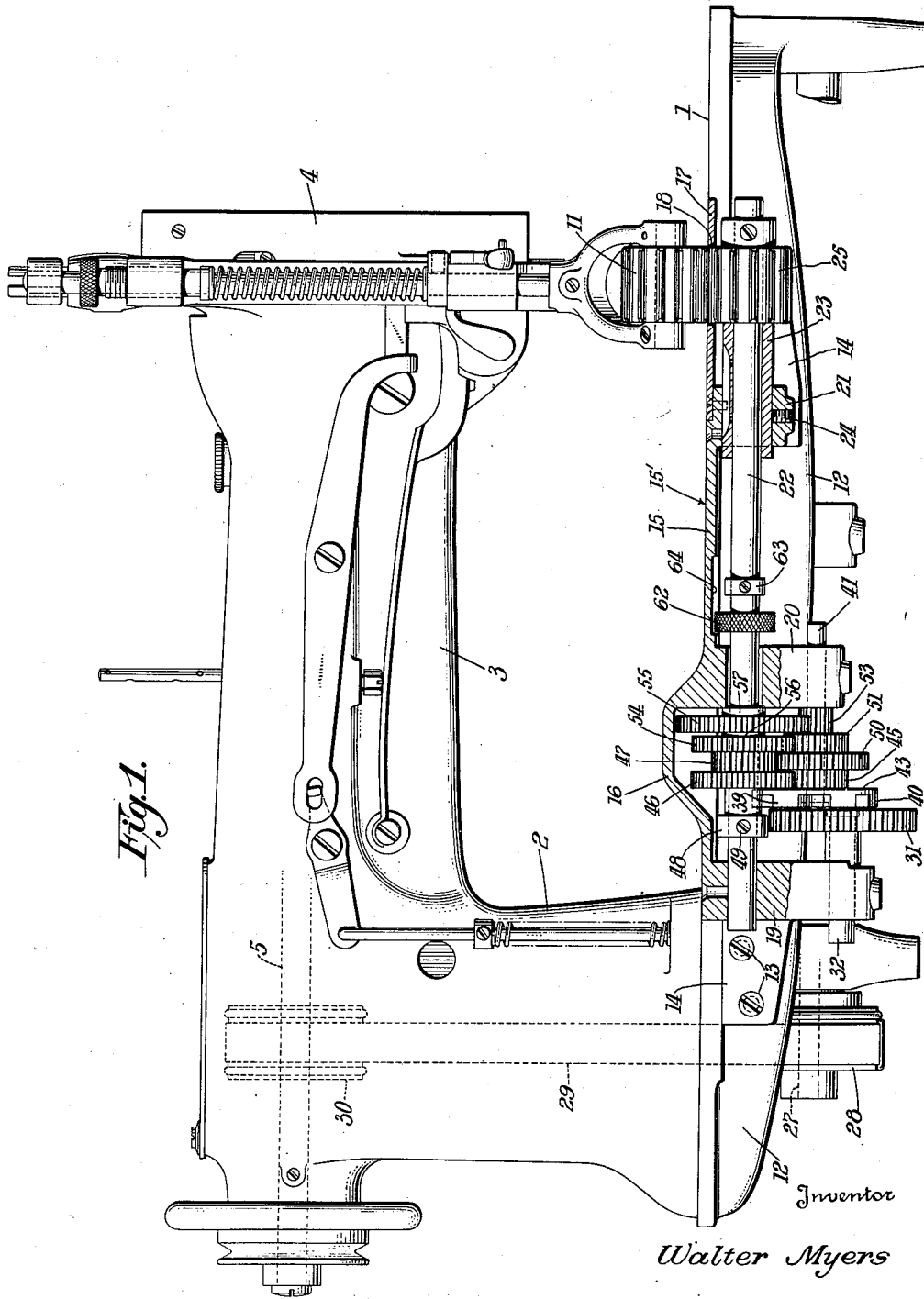
W. MYERS

2,254,779

PULL-FEED MECHANISM FOR SEWING MACHINES

Filed Oct. 24, 1939

4 Sheets-Sheet 1



Witness:
Godfrey Pecina

By Henry J. Miller
Attorney

Sept. 2, 1941.

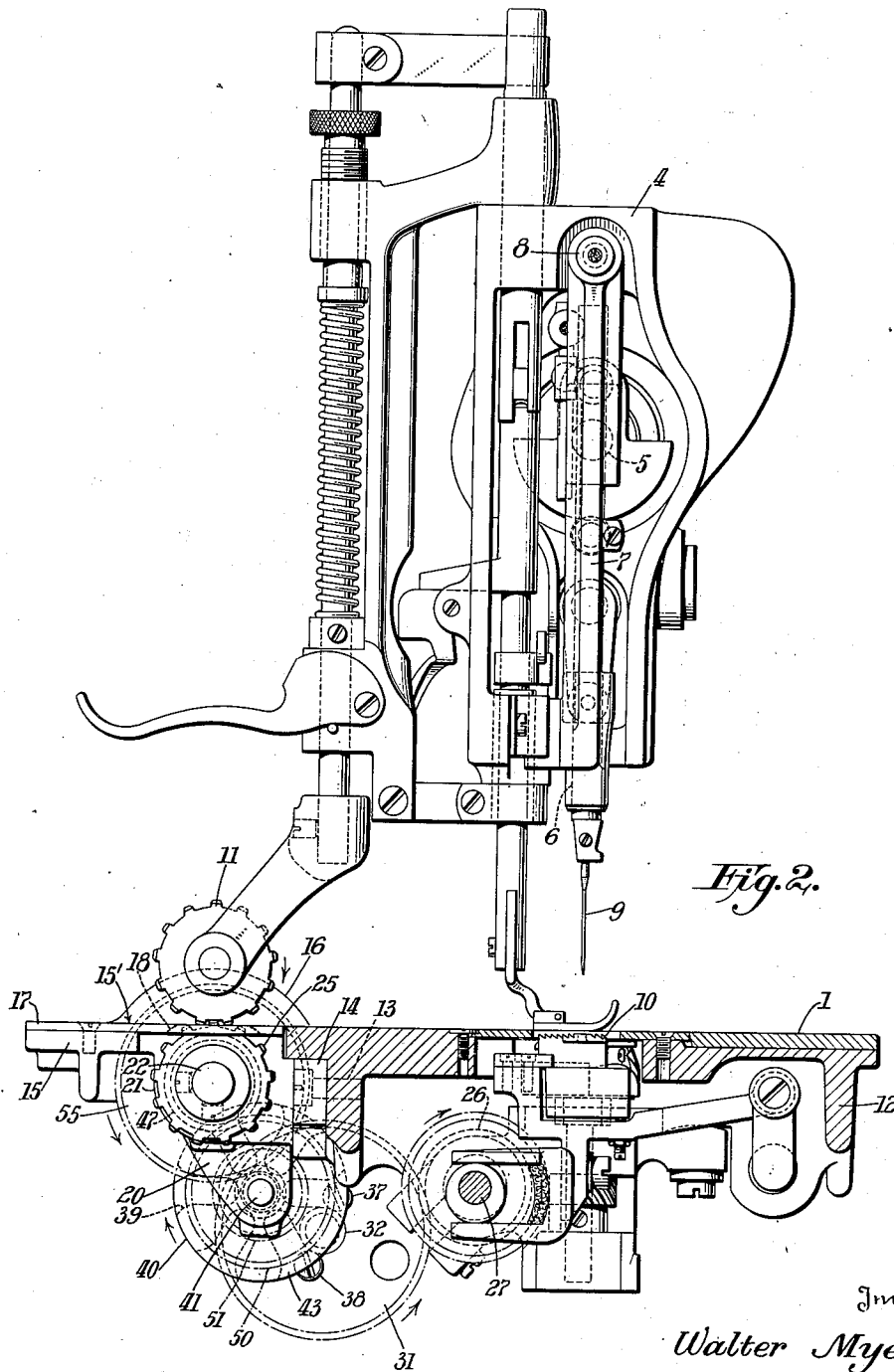
W. MYERS

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PULL-FEED MECHANISM FOR SEWING MACHINES

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4 Sheets-Sheet 2



Inventor

Walter Myers

Witness
Joseph Reina

By Henry Miller

Attorney

Sept. 2, 1941.

W. MYERS

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4 Sheets-Sheet 3

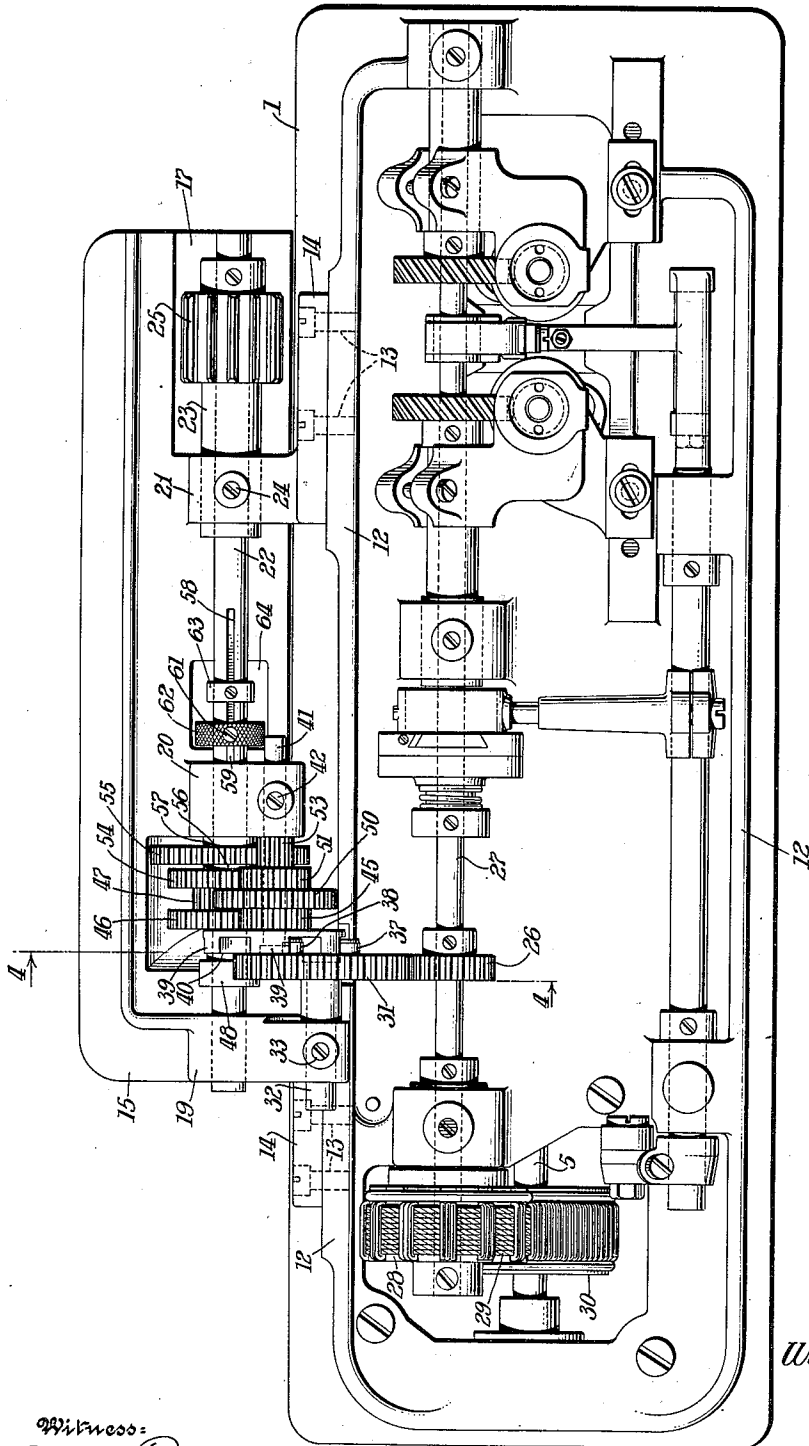


Fig. 3.

Inventor
Walter Myers

Witness:
Joseph Pecina

By Henry J. Miller, Attorney

Sept. 2, 1941.

W. MYERS

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4 Sheets-Sheet 4

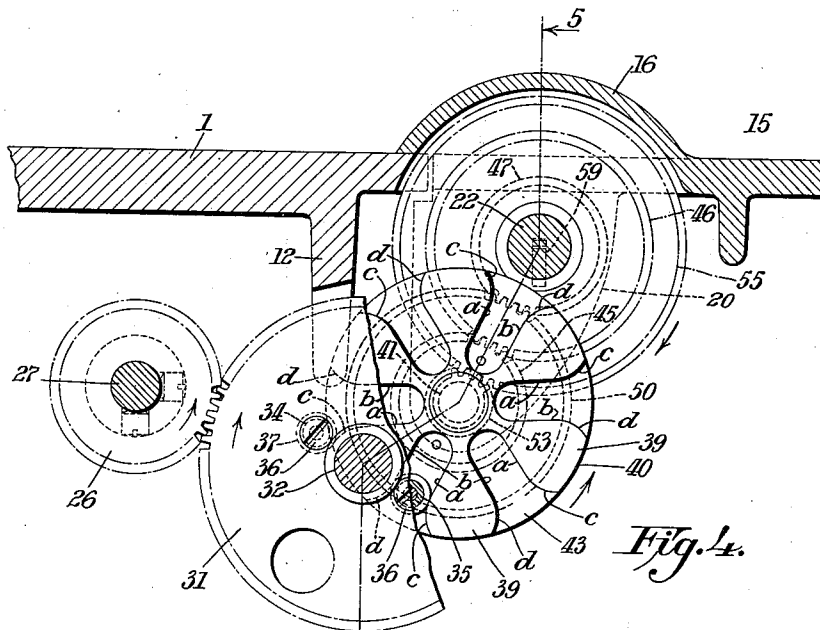


Fig. 4.

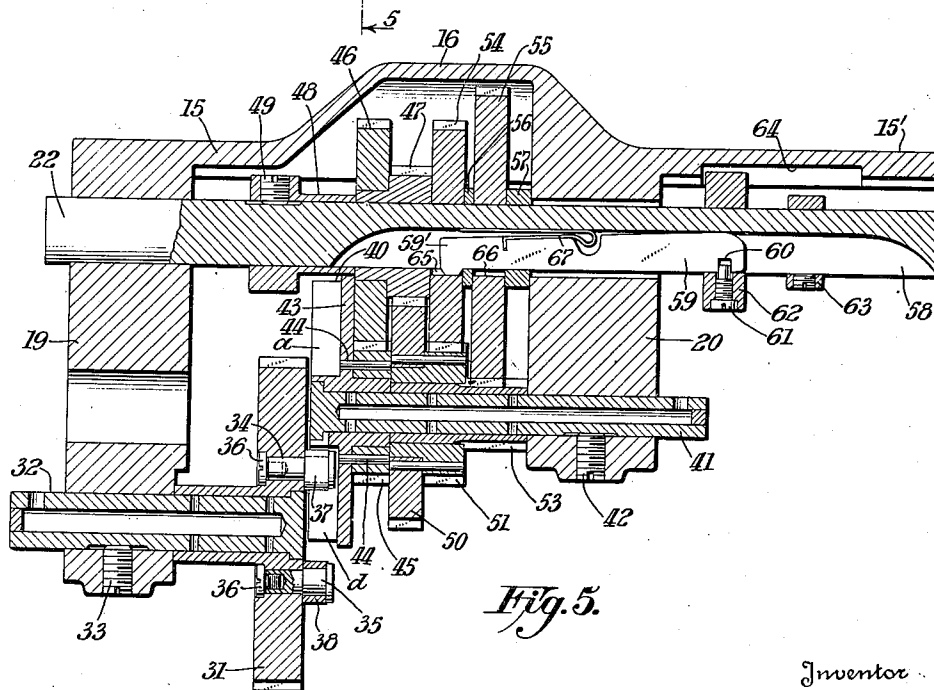


Fig. 5.

Inventor

Walter Myers

Witness:

Joseph Reina

By

Henry J. Miller

Attorney

UNITED STATES PATENT OFFICE

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PULL-FEED MECHANISM FOR SEWING MACHINES

Walter Myers, Bridgeport, Conn., assignor to The Singer Manufacturing Company, Elizabeth, N. J., a corporation of New Jersey

Application October 24, 1939, Serial No. 300,914

6 Claims. (Cl. 112-214)

This invention relates to pull-feed mechanisms for sewing machines acting upon the work rearwardly of the sewing machine needle and therefore functioning to pull the work past or away from the stitch-forming mechanism of the machine.

The primary object of the invention is to provide an intermittently feeding pull-feed mechanism for sewing machines adapted for high speed operation while maintaining constant a selected amplitude of feed.

Another object of the invention is to provide an effectively operating pull-feed mechanism having means for conveniently changing from one to another predetermined amplitude of feed. The invention has also for its object to provide an improved pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine.

With these and other objects in view, as will hereinafter appear, the invention consists in the devices, combinations and arrangements of parts described in connection with the accompanying drawings which illustrate a preferred embodiment of the invention and in which:

Fig. 1 is a rear side elevation of a sewing machine containing the improved pull-feed mechanism, the bed-plate extension, or pull-feed bracket, of the machine being shown partly in vertical section. Fig. 2 is a front end elevation of the sewing machine, with the bracket-arm face-plate removed and the bed-plate in vertical section. Fig. 3 is a bottom plan view of the machine. Fig. 4 represents an enlarged vertical section of the pull-feed driving mechanism on substantially the line 4-4 of Fig. 3, the driver pin-wheel being partly broken away. Fig. 5 represents a generally vertical section of the speed-changing mechanism, the section being taken substantially on the broken line 5-5 of Fig. 4, but in a different relative position of the gears of said mechanism.

The sewing machine shown in the drawings has a bed-plate 1, from one end portion of which rises the standard 2 of a tubular bracket-arm 3 overhanging the bed-plate and terminating at its free end in a head 4.

Rotatably journaled in the bracket-arm 3 is a main actuating shaft 5 connected to reciprocate a needle-bar 6 in the swinging frame 7, said frame 7 being pivotally hung at its upper end upon a fulcrum-stud 8 secured in the bracket-arm head 4, whereby the frame 7 may be vibrated to impart work-feeding movements to a

needle or needles 9 secured to the lower end of the needle-bar 6. In the present machine, the needle-bar frame 7 is vibrated by mechanism corresponding to that more fully disclosed in my prior U. S. Patent No. 2,128,031, Aug. 23, 1938, which also discloses the loop-taker mechanism and the mechanism for actuating the feed-dog 10 employed in the present machine. The clothes-presser mechanism, including the pull-feed presser-roller 11, is substantially the same as that disclosed in the U. S. patent to J. C. Ringe, No. 1,368,293, Feb. 15, 1921.

Depending from the front and rear side edges of the bed-plate 1 are the usual reinforcing ribs or flanges 12, and detachably secured by screws 13 to the outer side face of the rearward flange 12 are horizontally spaced supporting-ears 14 of a pull-feed bracket 15. The bracket 15 has a flat work-supporting face 15' which is substantially flush with the upper or work-supporting face of the bed-plate 1. At its end adjacent the bracket-arm standard 2, the bracket 15 has an upwardly arched portion 16 providing gear clearance, and detachably secured upon the other end of said bracket is a work-plate 17 provided with a pull-feed roller clearance slot 18.

Depending from the bracket 15 are three bearing-lugs 19, 20 and 21 provided with horizontally aligned apertures. Rotatably journaled in the bearing-lug 19 is one end of a roller-carrying shaft 22 which extends freely through the aperture in the lug 20 and, adjacent its opposite end, is journaled in a bearing-bushing 23 secured by a screw 24 in the lug 21. Removably secured upon the projecting free end of the shaft 22, adjacent the bushing 23, is a lower pull-feed roller 25 which extends upwardly through the work-plate slot 18 and is opposed by the usual spring-depressed presser-roller 11.

The roller-carrying shaft 22 is actuated to rotate intermittently by mechanism providing for changing the speed of rotation of said shaft. To this end, a spur-gear 26 is secured upon the usual loop-taker and feed-actuating shaft 27 rotatably journaled below the bed-plate 1, said actuating shaft 27 carrying a belt-pulley 28 connected by a belt 29 to a pulley 30 carried by the main-shaft 5, whereby the shafts 5 and 27 rotate in one-to-one relation.

The spur-gear 26 is in driving engagement with a peripherally toothed pin-wheel 31 having its hub freely rotatable upon a stud-pin 32 disposed substantially parallel to the shafts 5, 22 and 27 and secured by a screw 33 in the bearing-

lug 19. As the spur-gear 26 is substantially one half the size of the pin-wheel 31, the speed of the latter is reduced to substantially one half of that of the shaft 27. Projecting from the same side face of the pin-wheel 31 so as to be disposed at diametrically opposite sides of the axis of rotation of said pin-wheel are substantially parallel and shouldered stud-pins 34 and 35 secured by screws 36 in suitable apertures in the pin-wheel 31. Carried by the projecting ends of said stud-pins are rollers 37 and 38.

The stud-pin rollers are adapted to engage the teeth 39 of a six-tooth star-wheel 40 freely rotatable upon a stud-pin 41, disposed in parallelism with the stud-pin 32 and secured in a suitable aperture in the bearing-lug 20 by a screw 42. As illustrated in Fig. 4 of the drawings, the star-wheel teeth 39 each have inwardly converging straight inner or active portions *a*, *b* which are equally and oppositely inclined to radial lines passing centrally through the teeth. The straight inner portion *a* of each tooth 39 is substantially parallel to the adjacent straight inner portion *b* of the succeeding tooth, and the adjacent parallel inner portions *a*, *b* of succeeding teeth are so directed that a straight line intersecting the axis of the star-wheel passes medianly between straight inner portions *a*, *b*, of teeth at opposite sides of said axis.

The straight inner portions *a*, *b* of the star-wheel teeth 39 merge tangentially with circular outer or dwell-producing portions *c*, *d*, terminating in the circular periphery of the star-wheel. The spacing apart of the active inner portions *a*, *b*, of the teeth 39 corresponds to the diameter of the pin-wheel rollers 37, 38, and the diameter of the curved dwell producing portions *c*, *d*, is equal to the spacing of said rollers from each other.

In Fig. 4 of the drawings, the roller 37 is at the point of initial engagement of the outer end of the dwell-producing portion *c* of a tooth 39 and the roller 38 is beginning to engage the inner end of the dwell-producing portion *d*, of the same tooth. Consequently, the rollers will now travel idly about the curved portions *c*, *d*, and the star-wheel 39 remains stationary during the fractional revolution of the pin-wheel 31 required to bring the roller 37 into engagement with the straight inner or active portion *a*, whereupon the star-wheel 40 is rotated until the roller 38 begins to engage the rounded dwell-producing portion *c* of the succeeding tooth. It will be noted that the star-wheel 40, when stationary, is positively held against rotation by the rollers 37, 38 for a very appreciable interval and therefore, that the star-wheel cannot overthrow even at high speed rotation of the pin-wheel. To withstand the stress incidental to high speed operation, the star-wheel teeth 39 are preferably reinforced by a disk 43 which may be integral with a side face of said star-wheel, or may be brazed or otherwise secured to corresponding side faces of the several teeth 39.

Disposed upon the hub of the star-wheel 40 at the side thereof opposite to the pin-wheel 31, and secured for rotation with said star-wheel as by pins 44, is a small spur-gear 45 in constant mesh with a relatively larger spur-gear 46. The spur-gear 46 is force fitted or otherwise rigidly secured upon the reduced hub of a smaller spur-gear 47 for unison rotation therewith. The small spur-gear 47 is journaled for free rotation upon the roller-carrying shaft 22 and is restrained against movement in one direction endwise of said shaft

by a collar 48 secured upon the shaft 22 by a set-screw 49.

The spur-gear 47 is in constant driving engagement with a relatively larger spur-gear 50 disposed upon the reduced hub of a spur-gear 51 which is of substantially the same size as the spur-gears 45 and 47, the spur-gears 50 and 51 being pinned together for unison rotation. The spur-gear 51 is force fitted or otherwise rigidly secured upon the hub of a pinion 53 journaled for free rotation upon the stationary stud-pin 41. The spur-gear 51 is in constant mesh with a spur-gear 54, and the pinion 53 is likewise in constant mesh with a spur-gear 55, the spur-gears 54 and 55 being both journaled for free rotation upon the roller-carrying shaft 22 and being spaced from each other by a washer 56. The spur-gear 55 is similarly spaced by a washer 57 from the bearing-lug 20.

The roller-carrying shaft 22 is provided with a longitudinal slot 58, and shiftable endwise in said slot is a gear-locking key 59, having at one end a notch 60 entered by the reduced end of a shoulder-screw 61 threaded into a collar 62. The collar 62 is slidably disposed upon the shaft 22, its movement in one direction being limited by a collar 63 secured to said shaft 22. The collar 62 extends into a recess 64 formed in the bracket 15, one end of said recess limiting movement of the collar 62 in a direction away from the collar 63.

At its end opposite the collar 62, the key 59 has a laterally extending nose 59' adapted alternately to enter a notch 65 in the shaft-aperture of the spur-gear 54 and a notch 66 in the shaft aperture of the spur-gear 55. A spring 67 anchored to slide with the key 59 yieldingly urges the key-nose 59' to engage the spur-gears 54 and 55, the spacing washers 56 and 57 insuring proper engagement of said spur-gears by the key-nose 59'.

From the foregoing description, it will be understood that the angle of rotation stepwise imparted by the pin-wheel 31 to the star-wheel 40 is successively reduced by the train of speed-reducing gearing which transmits the star-wheel movements to the spur-gears 54 and 55 selectively secured to the pull-feed roller carrying shaft 22 by the key 59, said spur-gears 54 and 55 rotating intermittently at different speeds and selectively transmitting work-advancing movements of different amplitudes to the pull-feed roller 25. While the mechanism herein described provides for only two different speeds of the shaft 22, it will be obvious that the train of speed-reducing gearing may contain more than two gears capable of being selectively keyed to the shaft 22. Furthermore, the effective work-advancing movement of the pull-feed mechanism may also be modified by changing the pull-feed roller to one of different diameter. This may be readily effected by reason of the fact that the pull-feed roller 25 is detachably secured upon the free end of the shaft 22.

The driven portion of the pull-feed mechanism may be assembled in the bracket 15 and attached to or detached from the sewing machine as a unit, thereby facilitating proper positioning of the pull-feed mechanism shaft bearings and increasing the durability of the mechanism.

Having thus set forth the nature of the invention, what I claim herein is:

1. A pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine, comprising, a supporting bracket, a pull-feed roller carrying shaft rotatably journaled in said bracket, a plurality of gear-wheels rotatably

mounted upon said shaft, means for selectively keying any one of said gear-wheels to said shaft for rotation therewith, speed-reducing mechanism carried by said bracket for rotating said gear-wheels at different speeds, an intermittently rotated star-wheel journaled in said bracket and operatively connected to said speed-reducing mechanism, and a rotary pin-wheel in constant operative engagement with said star-wheel for imparting intermittent rotation thereto.

2. A pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine, comprising, a supporting bracket, a pull-feed roller carrying shaft rotatably journaled in said bracket, a plurality of gear-wheels rotatably mounted upon said shaft, means for selectively keying any one of said gear-wheels to said shaft for rotation therewith, speed-reducing mechanism carried by said bracket for rotating said gear-wheels at different speeds, an intermittently rotated star-wheel operatively connected to said speed-reducing mechanism and having a plurality of teeth provided with circularly rounded dwell-producing outer end portions, and a rotary pin-wheel having pins spaced diametrically of said wheel and projecting from a side face thereof, said pins being adapted alternately to engage successive teeth of said star-wheel for imparting intermittent rotation thereto.

3. A pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine, comprising, a supporting bracket, a pull-feed roller carrying shaft rotatably journaled in said bracket, a plurality of gear wheels rotatably mounted upon said shaft, means for selectively keying any one of said gear-wheels to said shaft, a stationary stud-pin carried by said bracket and lengthwise disposed substantially parallel to said shaft, speed-reducing gearing for driving said gear-wheels consisting of a set of spur-gears rotatably journaled upon said stud-pin and a second set of spur-gears in constant mesh therewith, said second set of gears being rotatably journaled upon said shaft, an intermittently rotated star-wheel journaled in said bracket and operatively connected to said speed-reducing gearing, and a pin-wheel rotatably journaled in said bracket and in operative engagement with said star-wheel for imparting intermittent rotation thereto.

4. A pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine, comprising, a supporting bracket, a pull-feed roller carrying shaft rotatably journaled in said bracket, a plurality of gear-wheels rotatably mounted upon said shaft, means for selectively keying any one of said gear-wheels to said shaft, a stationary stud-pin carried by said bracket and lengthwise disposed substantially parallel to said shaft, speed-reducing gearing for driving said gear-wheels consisting of a set of spur-gears rotatably journaled upon said stud-pin and a sec-

ond set of spur-gears in constant mesh therewith, said second set of gears being rotatably journaled upon said shaft, an intermittently rotated star-wheel rotatably journaled upon said stud-pin and operatively connected to said speed-reducing gearing for rotation therewith, said star-wheel having a plurality of teeth provided with inner active portions and circularly rounded dwell-producing outer end portions, and a rotary pin-wheel having pins adapted alternately to engage successive teeth of said star-wheel, said pins being spaced from each other diametrically of said star-wheel a distance substantially equal to the diameter of the circularly rounded ends of the star-wheel teeth.

5. A pull-feed mechanism assembly adapted to be attached as a unit to a sewing machine, comprising, a supporting bracket providing a work-supporting surface and having spaced bearings, a shaft rotatably journaled in said bearings and having a free end portion extending beyond one of said bearings, a pull-feed roller detachably secured upon said free end portion of said shaft, a plurality of gear-wheels rotatably mounted upon said shaft, means for keying selected ones of said gear-wheels to said shaft for rotation therewith, speed-reducing gearing carried by said bracket and in constant driving engagement with said gear-wheels, a driving member rotatably journaled upon said bracket, and a driven member intermittently rotated by said driving member and operatively connected to said speed-reducing gearing for rotation therewith.

6. The combination with a sewing machine having a work-supporting bed-plate, a rotary actuating shaft, and stitch-forming mechanism including a reciprocatory needle, of a pull-feed mechanism comprising a pull-feed roller disposed rearwardly of said needle, a presser-roller opposed to said pull-feed roller, a rotary pull-feed roller carrying shaft provided longitudinally thereof with a slot, a plurality of gear-wheels rotatably mounted upon said roller-carrying shaft, a key slidably disposed in said slot for keying selected ones of said gears for rotation with said roller-carrying shaft, a stationary stud-pin disposed substantially parallel to said roller-carrying shaft, speed-reducing gearing in constant driving engagement with said gears and consisting of a set of spur-gears rotatably journaled upon said stud-pin and a second set of spur-gears in constant mesh therewith, said second set of spur-gears being rotatably journaled upon said roller-carrying shaft, an intermittently rotated star-wheel rotatably journaled upon said stud-pin and operatively connected to said speed-reducing gearing for rotation therewith, a rotary pin-wheel having pins adapted alternately to engage successive teeth of said star-wheel, and driving connections for rotating said pin-wheel from the actuating shaft of the sewing machine.

WALTER MYERS.