Sept. 11, 1962 M. R. KELEMENCKY 3,053,204

SEWING MACHINES

Filed July 24, 1959 6 Sheets-Sheet 1

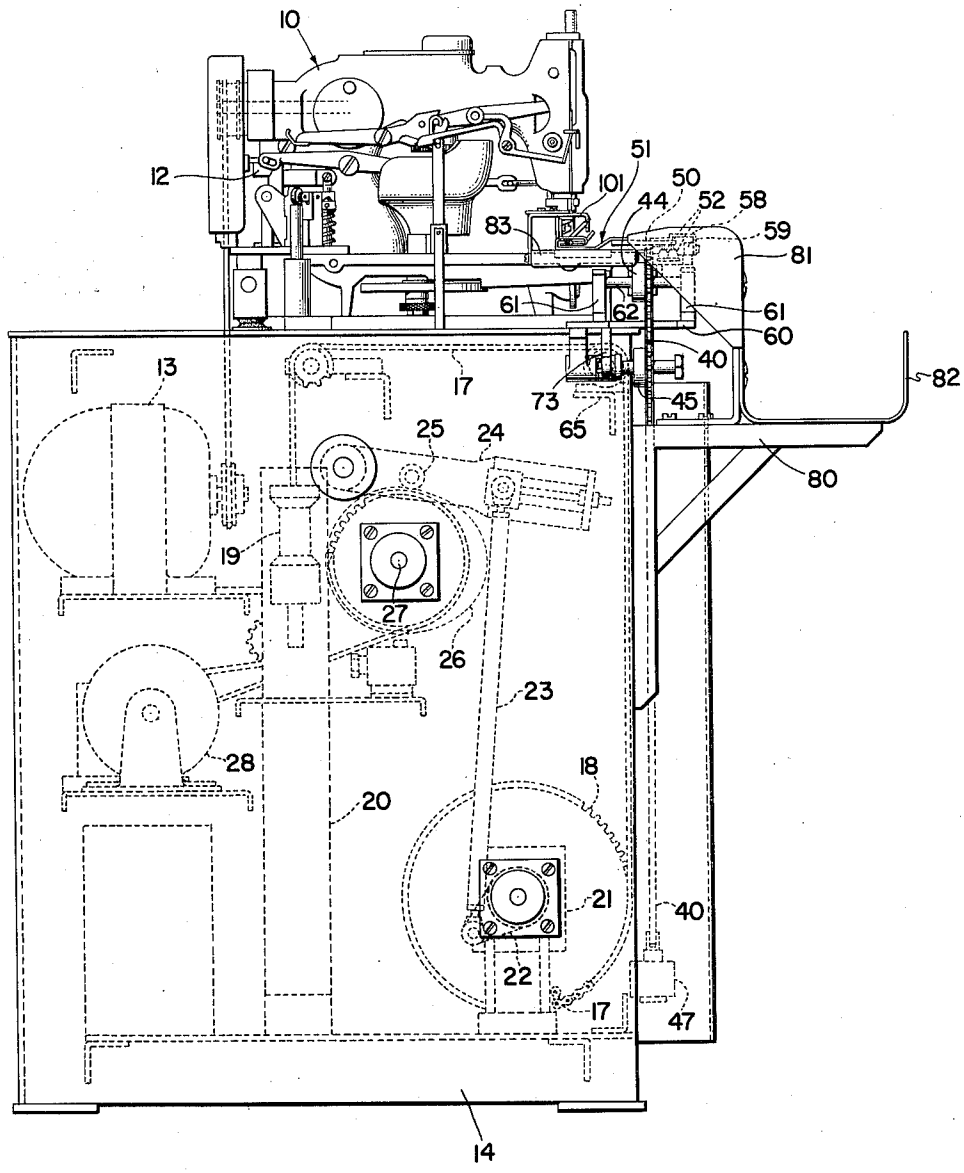

Fig. 1.

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SEWING MACHINES

Filed July 24, 1959 6 Sheets-Sheet 2

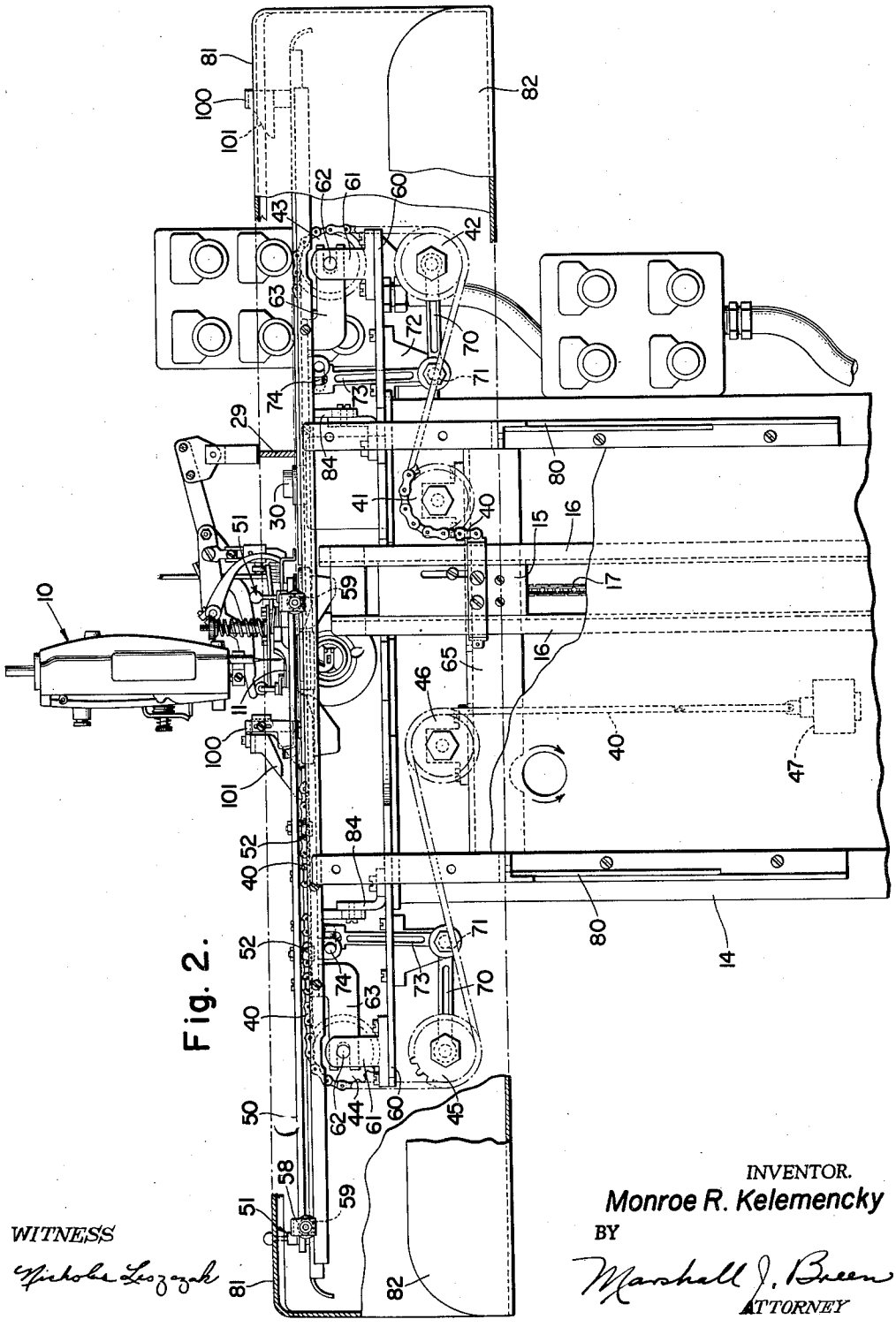

Fig. 2.

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Filed July 24, 1959 6 Sheets-Sheet 3

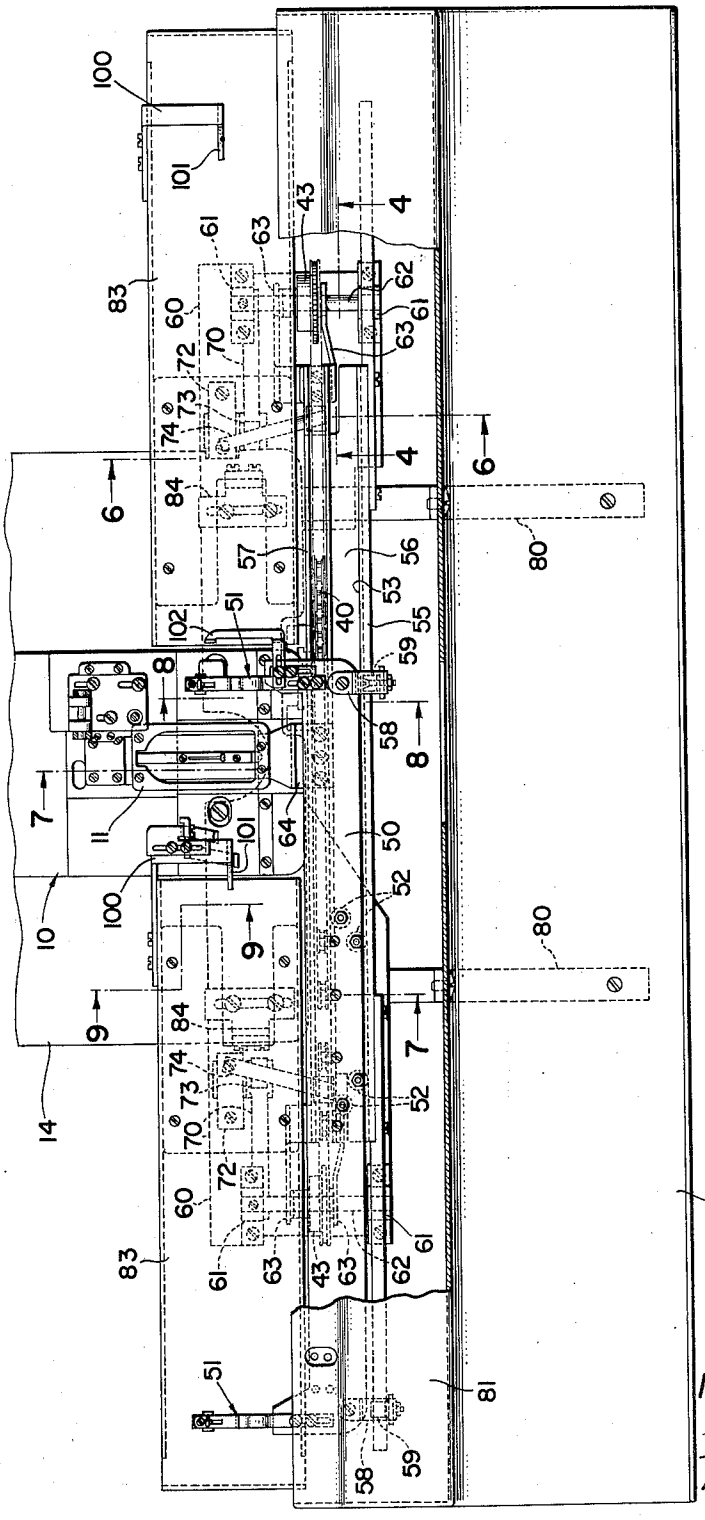

Fig. 3.

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SEWING MACHINES

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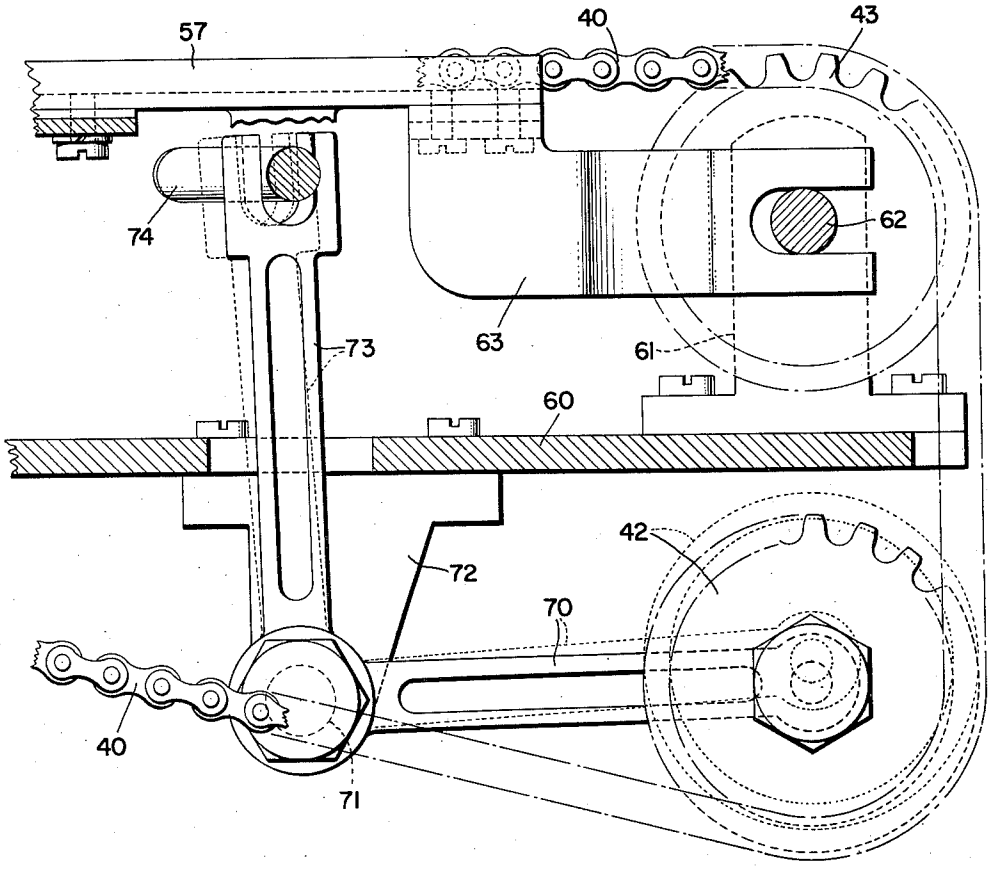

Fig. 4.

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SEWING MACHINES

Filed July 24, 1959 6 Sheets-Sheet 5

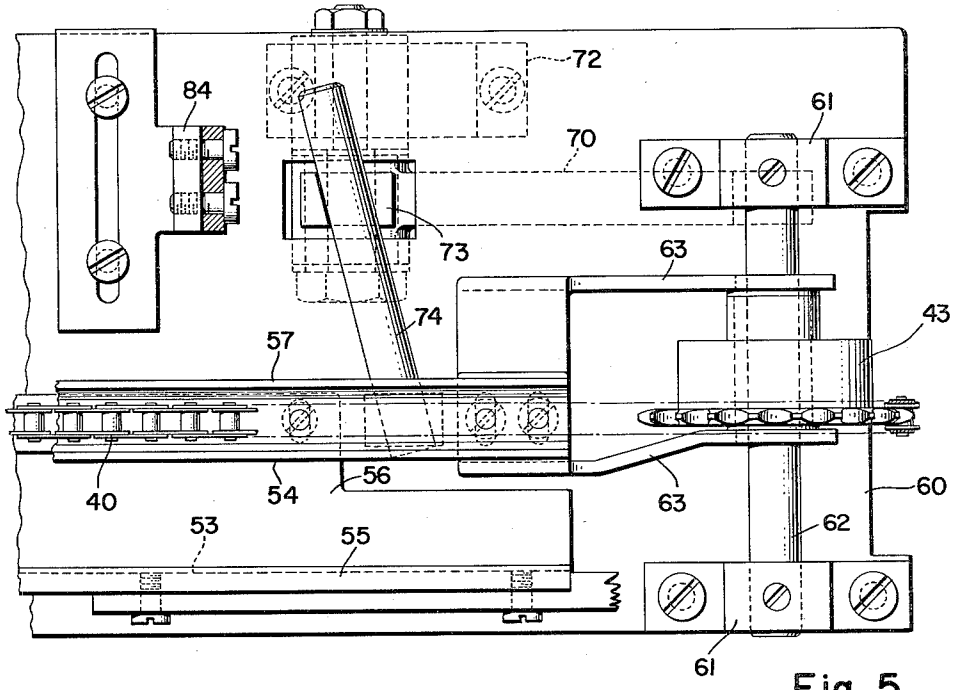

Fig. 5.

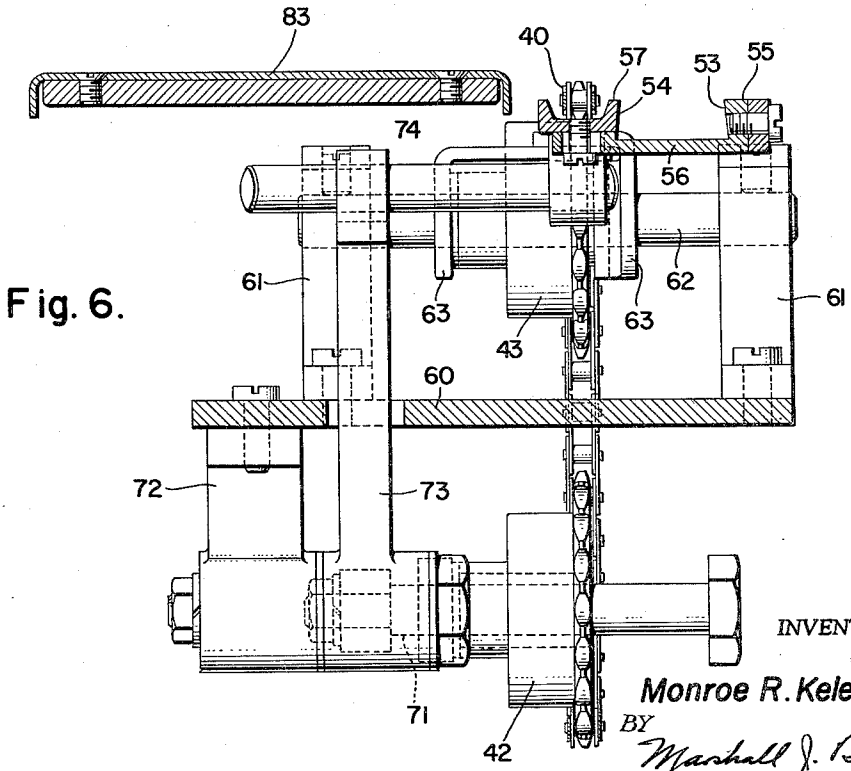

Fig. 6.

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SEWING MACHINES

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Fig. 7.

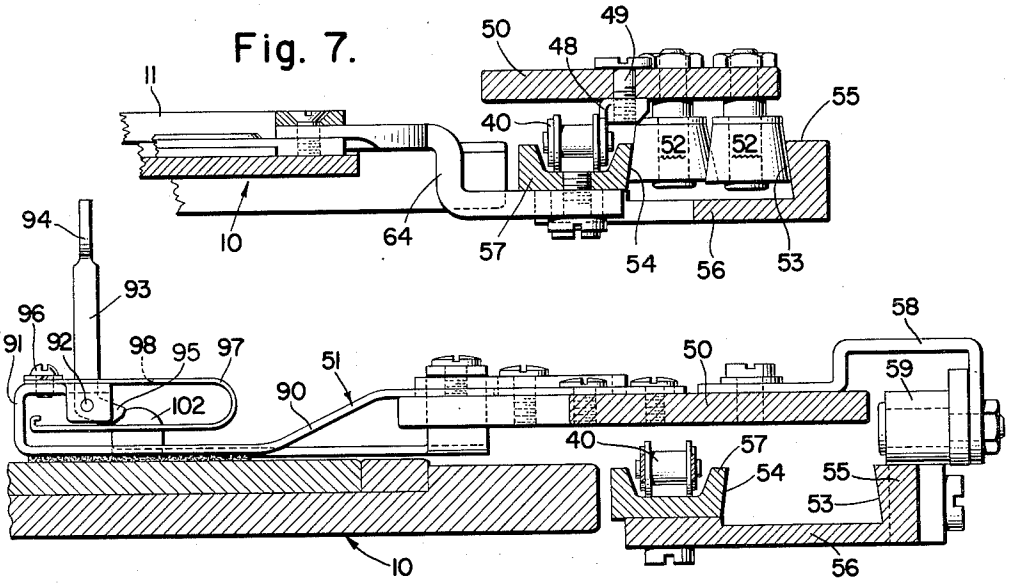

Fig. 8.

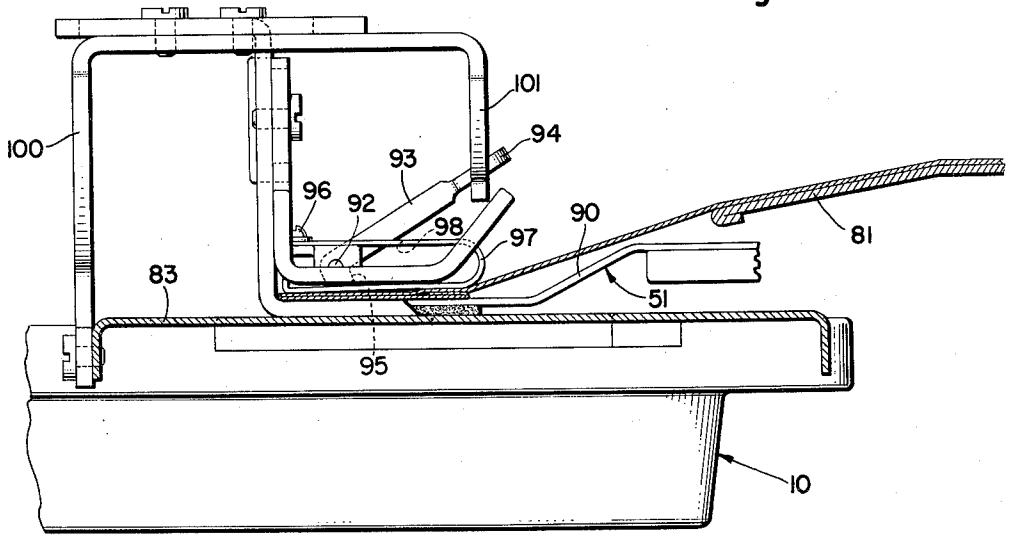

Fig. 9.

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United States Patent Office 3,053,204 Patented Sept. 11, 1962

3,053,204

SEWING MACHINES

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Filed July 24, 1959, Ser. No. 829,394
7 Claims. (Cl. 112—2)

This invention relates to sewing machines and, more particularly, to a sewing and work fabric indexing unit for accomplishing automatically all like stitching operations on a garment or a garment panel.

It is an object of this invention to provide a new and improved work indexing mechanism for advancing automatically a work fabric relatively to a sewing machine.

Another object of this invention is to provide a work indexing mechanism for a sewing machine which may be adapted readily and conveniently to advance a work fabric either from the right or the left hand side of the sewing machine, thus to accommodate, for instance, button and buttonholing operations on either men's or women's garments which, as is well known, traditionally button to the opposite hand.

Still another object of this invention is to provide a compensating mechanism for a work indexing device that is driven by a sprocket chain for the purpose of preventing endwise movement of the sprocket chain arising out of lateral movement of a portion of the sprocket chain with the sewing machine work clamp.

With the above and other objects and advantages in view as will hereinafter appear, this invention comprises the devices, combinations, and arrangements of parts hereinafter described and illustrated in he accompanying drawings of a preferred embodiment in which:

FIG. 1 represents a side elevational view of a sewing unit having this invention applied thereto.

FIG. 2 represents a front elevational view of the sewing unit of FIG. 1 with portions of the guard plates broken away,

FIG. 3 represents a top plan view of the work indexing portion of the sewing unit of FIGS. 1 and 2, including a fragment of the sewing machine work clamp and with portions of the guard plates broken away,

FIG. 4 is an enlarged cross-sectional view taken substantially along line 4—4 of FIG. 3 illustrating the sprockets and the motion compensating mechanism therefor at one side of the work indexing unit,

FIG. 5 represents an enlarged top plan view of the sprockets and motion compensating mechanism at the right hand side of the work indexing unit, as viewed in FIG. 3, with the guard plates broken away,

FIG. 6 is an enlarged cross-sectional view of the sprockets and motion compensating mechanism therefor taken substantially along line 6—6 of FIG. 3,

FIG. 7 is an enlarged cross-sectional view of the means means connecting the work indexing mechanism with the sewing machine work clamp taken substantially along line 7—7 of FIG. 3,

FIG. 8 is an enlarged cross-sectional view of the work gripping means taken substantially along line 8—8 of FIG. 3, and

FIG. 9 is an enlarged cross-sectional view of the work gripping means, together with the work gripper release device, taken substantially along line 9—9 of FIG. 3.

Referring particularly to FIGS. 1, 2 and 3, this invention is illustrated as applied to an automatic sequential buttonholing unit of the type disclosed in the copending patent application of T. A. McGill et al., Serial No. 686,303, filed September 26, 1957, now Patent No. 2,989,013, granted June 20, 1961, to which reference may be had for a complete understanding of the unit.

Indicated generally as **10** in the drawings, is a conventional buttonhole sewing machine which, in addition to stitch forming instrumentalities, includes a work clamp **11** shiftable lengthwise of the sewing machine frame to provide the stitching along each side of the buttonhole, stop motion mechanism **12** for starting and automatically stopping the sewing machine when the buttonhole stitching is completed, and an electric driving motor **13**.

The sewing machine is carried atop a cabinet **14** within which is housed the sewing machine driving motor **13** and the work indexing mechanism by which a work fabric may be transported relatively to the sewing machine between successive buttonhole sewing cycles to position the buttonholes in a predetermined spaced relatinoship in the garment.

Briefly, the work indexing mechanism involves the use of a carriage **15** slidable vertically between guide rails **16** arranged in the cabinet. A chain **17** secured to the carriage is fast at one end to a sprocket wheel **18** by which the carriage **15** is moved downwardly in predetermined increments. At the other end, the chain **17** carries a counterweight **19** guided in a tube **20** for returning the carriage when the sprocket wheel **18** is released for retrograde movement.

Associated with the sprocket wheel **18** is an electric clutch **21** to control retrograde movement of the sprocket wheel, and a one-way or overrunning clutch **22** by which the sprocket wheel is driven to space adjacent buttonholes. The overrunning clutch **22** is actuated by a link **23** connected to an indexing lever **24** having thereon a cam follower **25** which tracks an indexing cam **26** carried on a cam shaft **27** journaled in the cabinet **14**. The cam shaft **27** is operated by means of a one-revolution clutch (not shown) from a continuously running drive motor **28**. In addition to the indexing cam **26**, the cam shaft **27** carries other cams (not shown), one for shifting the sewing machine stop motion mechanism **12** into running position when indexing has been completed, and another for opening and closing the sewing machine work clamp **11** by way of a cable **29**.

The specific means by which sequential operation of the sewing machine and of the indexing mechanism is attained is disclosed in detail in the above referenced McGill et al. patent application. It will be sufficient for an understanding of this invention to have in mind that from a raised starting position of the work indexing carriage **15**, as illustrated in FIG. 2, depression of a start button **30** by the operator will initiate operation of the sewing machine. Automatic stopping of the sewing machine will trip the one-revolution clutch on the cam shaft **27** so that the work indexing carriage will be shifted downwardly one increment at completion of which the sewing machine will again be restarted. This alternate sewing and indexing will continue until a predetermined number of sewing operations have been completed at which time the electric clutch **21** will be released freeing the chain **17** and carriage **15** for return

to starting position under the influence of the counterweight 19.

In order to index a garment or fabric panel in a horizontal plane transversely across the sewing machine, that is, perpendicular to the direction of movement of the sewing machine work clamp, so that the buttonholes will be produced perpendicular to an edge of the garment, as is common in sport garments, etc., a link chain 40 is provided. The chain is secured at one extremity to the carriage 15 of the work indexing device, directed to the sprocket wheels 41, 42, and 43 at one side of the sewing machine, wheels 44, 45, and 46 at the other side of the sewing machine, and thence downwardly to a counterweight 47 at the opposite extremity of the chain.

The chain 40 may be one continuous length or it may comprise two pieces, each secured by clips 48 and fastening screws 49 to a traveling work holder 50, as best illustrated in FIG. 7. As illustrated in FIGS. 3 and 8, the traveling work holder 50 has secured thereto a pair of work gripping clamps indicated generally as 51, one clamp at each extremity of the traveling work holder.

Secured to the traveling work holder are a plurality of vertical axis tapered rollers 52 which are offset relatively one to another and snugly engage the inclined walls 53 and 54 of a track defined between the upstanding rim 55 of a carrier plate 56 and the contiguous side of an upwardly open channel member 57 secured to the plate. The traveling work holder is also provided with a pair of brackets 58 each supporting a horizontal axis roller 59 which rides upon the upstanding rim 55 of the carrier plate 56.

Carried on the cabinet 14 is a support plate 60 which sustains at each extremity a pair of brackets 61—61, each pair of brackets carrying a shaft 62 therebetween. The link chain sprockets 43 and 44 are journaled for turning and axial sliding movement one on each of the shafts 62. The link chain 40 is directed over the sprocket 43 along the upwardly open channel member 57 and over the sprocket 44. In order to sustain the carrier plate 56 and the channel member 57 and also to maintain the sprockets 43 and 44 in alignment with the channel member 57, a two-armed bracket member 63 is fastened to each extremity of the channel member 57 (FIGS. 4 and 5), the arms of the bracket member straddling the respective sprocket and being bifurcated to embrace the shaft 62.

Referring to FIGS. 3 and 7, a connecting piece 64 is secured to the sewing machine work clamp 11 and to the upwardly open channel member 57 such that the channel member 57, the carrier plate 56 secured thereto, the link chain in the channel member, the sprockets 43 and 44, the traveling work holder 50, and the pair of work gripping clamps 51, will move with the sewing machine work clamp in a direction parallel to the axis of the sewing machine main shaft while the buttonhole is being sewn. An advantage of this construction is that a work fabric held in the work gripping clamps 51 need not be released during the entire buttonhole sewing operation so that no spacing errors can arise because of shifting of the work relatively to the work gripping clamps. The idler sprockets 41 and 46, however, are secured on a cross brace 65 of the cabinet 14 and must be fixed axially so as to remain in alignment with the point of connection of the chain 40 with the carriage 15. It will be understood that this applies to both idler sprockets 41 and 46 since the chain connection with the carriage 15 and the counterweight 47 may be reversed to drive the traveling work holder 50 in either direction so that either men's or women's wear may be accommodated no matter whether they button to the left or the right.

Since, therefore, the idler sprockets 41 and 46 are fixed against axial movement and the sprockets 43 and 44 shift axially with the work, the chain 40 will tend to shift along the upwardly open channel member 57 when the sprockets 43 and 44 are shifted axially. The effective length of the chain will shorten as the sprockets move axially outwardly and will lengthen as the sprockets return. In the absence of any compensation for endwise shifting of the chain, the indexing mechanism and the sewing machine work clamp would conflict during the sewing of a buttonhole and the work would either tear, slip relatively to the sewing machine work clamp resulting in distorted buttonholes, or slip relatively to the indexing mechanism resulting in improper spacing. To compensate for this endwise movement of the chain 40, the sprocket wheels 42 and 45, one of the group of three at each side of the stitching point, are automatically adjustable to offset the chain movement. Since the compensating mechanism is similar at each side, only that associated with the sprocket 42 will be described in detail.

As will be seen in FIG. 4, the sprocket wheel 42 is journaled in one limb 70 of a bell crank lever fulcrumed at 71 in a bracket 72 fast on the support plate 60. The other limb 73 of the bell crank is bifurcated and embraces a rod 74 carried by the upwardly open channel member. The rod 74 is disposed substantially horizontally and, as illustrated in FIG. 3, is inclined relatively to the direction of movement of the sewing machine work clamp. The inclined rod 74, when moved with the traveling work holder and the work, will impart turning movement to the bell crank lever 70, 73 thus shifting the axis of the sprocket 42 toward or away from the axis of the sprocket 43 to compensate for the effects of axial shifting of the sprocket 43. The inclination of the rod 74 will determine the degree of compensation which is preferably made to cancel out completely the endwise shifting motion of the chain 40 in the channel member 57.

Supported on angle brackets 80 on the front of the cabinet 14 is a sheet metal top cover 81 which, as illustrated in FIGS. 1, 2, and 3, extends over the traveling work holder 50 and the rollers 52 and 59 to protect a garment fabric from interference therewith. Carried on the angle brackets 80 in front of the top cover is an upwardly open trough 82 into which each garment or fabric section falls at the completion of the operation of the unit.

The work gripping clamps 51 project from beneath the top cover and overlie, at each side of the sewing machine, sheet metal trays 83. The trays 83 are supported by brackets 84 from the support plate 60.

Referring particularly to FIGS. 8 and 9, the work gripping clamps 51 each comprise an arm 90 of substantially rigid material bent downwardly substantially to the level of the top of the sewing machine work supporting plate. The arm 90 at the free extremity is formed with a portion 91 bent upwardly and turned back upon itself and terminating in an enlarged boss 92 in which is pivoted an opening and closing lever 93 having an upstanding arm formed with a finger grip 94 and a depending cam arm 95. Fastened, as by a screw 96, on the upturned portion 91 of the work gripping arm is a U-shaped flexible member 97 slotted, as at 98, to accommodate the finger grip portion 94 of the gripper closing lever 93 and underlying the cam arm 95 of the lever 93. When the gripper closing lever 93 is turned toward the front of the unit, as illustrated in FIG. 9, the cam arm 95 will depress the flexible member 97 and clamp a work fabric between the flexible member 97 and the arm 90 of the work gripper. In the position illustrated in FIG. 9, the cam arm 95 is turned to the left of the pivotal connection of the lever 93 with the enlarged boss 92. On a snap-over-center principle, therefore, the lever 93 will be locked in the position illustrated in FIG. 9 in which work is clamped therein. Referring to FIGS. 2 and 3, work gripper opening members 100 are secured to the trays 83 and formed with wedge-shaped free extremities 101 disposed to operate beneath the gripper closing levers 93 to cam the

levers up beyond the snap-over-center point from which the spring members **91** will return the gripper closing levers to the completely opened position illustrated in FIG. 8.

The work gripping clamps in FIGS. 2 and 3 are illustrated in the starting position ready to accommodate a fabric panel such as a shirt front or the like to which buttonholes are to be applied. An edge guide **102** may be secured to the lead gripping clamp **51** properly to orient the garment panel in the clamps. After the operator has inserted the garment panel into the clamps and closed the clamps by turning the closing levers to the position illustrated in FIG. 9, operation of the unit may be started by pressing the button **30**. Alternate operation of the sewing machine and of the work indexing mechanism reaches a predetermined point, that is, until a predetermined number of operations have occurred at which time operation of the unit ceases and the traveling work holder together with the work gripping clamps will be returned to the starting position. The work gripper opening members **100** are preferably disposed so as to open the work grippers on the final movement of the traveling work holder so that the fabric being stitched will be released from the gripper before the grippers are returned to starting position and the completed work will fall into the trough **82**. The work grippers will thus be empty upon return to starting position and ready for the insertion of the next fabric panel.

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

1. In a sewing unit having a sewing machine, clamp means associated with said sewing machine for engaging and shifting a work fabric during the sewing operation, a work indexing means for shifting a work fabric between successive sewing operations, and automatic means for alternately operating said sewing machine and said work indexing means, said work indexing means including a flexible conveyor, a plurality of wheels disposed on substantially parallel axes for supporting said flexible conveyor, guide means for directing said flexible conveyor in a lineal path relatively to said sewing machine, means operatively connecting said conveyor guide means with said sewing machine clamp means for movement of said guide means with said clamp means, and means responsive to movement of said guide means for changing the axis spacing of at least one pair of said conveyor supporting wheels.

2. In a sewing unit having a sewing machine, work clamp means associated with said sewing machine for engaging and shifting a work fabric lengthwise of the sewing machine during the sewing operation, a work indexing means for shifting a work fabric laterally across said sewing machine between successive sewing operations, said work indexing means including a flexible conveyor, guide means for directing said flexible conveyor in a lineal path laterally across said sewing machine, means operative connecting said guide means to said sewing machine work clamp means for movement therewith lengthwise of said sewing machine, a plurality of wheels disposed on substantially parallel axes for supporting said flexible conveyor, at least one of said wheels being shiftable axially with said guide means, at least one of said wheels being fixed axially, and means responsive to movement of said guide means with said sewing machine work clamp for changing the axial spacing of at least one pair of said wheels.

3. In a sewing unit having a sewing machine, work clamp means associated with said sewing machine for engaging and shifting a work fabric lengthwise of the sewing machine during the sewing operation, a work indexing means for shifting a work fabric laterally across said sewing machine between successive sewing operations, said work indexing means including a pair of supporting shafts disposed substantially parallel to the direction of shifting movement of said sewing machine work clamps means, a carrier member slidably supported on said shaft for bodily movement axially thereon, means operatively connecting said sewing machine work clamp with said carrier member, a traveling work holder, means slidably supporting said work holder on said carrier memberber for movement laterally across the sewing machine, work gripping means carried on said work holder, a flexible conveyor secured to said work holder, guide means for said flexible conveyor associated with said carrier member, a plurality of parallel axes, wheels for supporting said flexible conveyor, one pair of said wheels being axially shiftable one on each of said supporting shafts, means on said carrier member for constraining said wheels for movement axially of said supporting shafts with said carrier member, another pair of said wheels being fixed against axial movement and associated one with each of said pair of axially shiftable wheels, and means responsive to movement of said carrier member for changing the axial spacing of at least two of said plurality of parallel axis wheels.

4. In a sewing unit having a sewing machine, work clamp means associated with said sewing machine for engaging and shifting a work fabric lengthwise of the sewing machine during the sewing operation, a work indexing means for shifting the work fabric laterally across said sewing machine between successive sewing operations, said work indexing means including a flexible belt comprising a series of pivotally connected links, guide means for directing said link-belt in a lineal path laterally across said sewing machine, means operatively connecting said guide means to said sewing machine work clamp for movement lengthwise of said sewing machine, a plurality of sprockets disposed on substantially parallel axes and in mesh with said link-belt, at least one of said sprockets being shiftable axially with said guide means, at least one of said sprockets being fixed axially, and means responsive to movement of said guide means with said sewing machine work clamp means for changing the axes spacing of at least one pair of said sprockets.

5. A sewing unit as set forth in claim 1 in which the means for changing the axial spacing of at least one pair of said wheels comprises a lever, means defining a fixed fulcrum for said lever with respect to the sewing unit, means for journaling one of said pair of wheels of which the axial spacing is to be changed in one arm of said lever, interengaging cam and follower means carried on the other arm of said lever and on said guide means for turning said lever about said fulcrum in response to movements of said guide means.

6. A sewing unit as set forth in claim 2 in which at each side of said carrier member are disposed three wheels, that is, one of said pair of wheels shiftably axially with said carrier member, one of said pair of wheels fixed against axial movement, and one of a third pair of wheels disposed to provide a sinuous path for the flexible conveyor about said three wheels, a pair of levers disposed one at each side of said carrier member, means pivotally supporting said levers on axes parallel to the axes of said three pair of wheels, and means responsive to movement of said carrier member for turning said levers to change the length of the sinuous path of said flexible conveyor.

7. In a sewing unit having a sewing machine, clamp means associated with said sewing machine for engaging and shifting a work fabric during the sewing operation, a work indexing means for shifting a work fabric between successive sewing operations, and automatic means for alternately operating said sewing machine and said work indexing means, said work indexing means including a flexible belt comprising a series of pivotally connected links, a plurality of sprocket wheels disposed on substantially parallel axes and in mesh with said link-belt, guide means for directing said link-belt in lineal path relatively to said sewing machine between two adjacent sprocket wheels, means operatively connecting said guide means

with said sewing machine clamp means for movement of said guide means with said clamp means, a bell crank lever pivoted in said sewing machine, one of said plurality of sprocket wheels being journaled in one arm of said bell crank lever, means defining a pivotal axis for turning of said bell crank substantially parallel to the axes of said sprocket wheels, a rod carried by said guide means and disposed at an acute angle to the axes of said sprocket wheels, and the other arm of said bell crank lever being bifurcated to embrace the rod carried by the guide means so as to effect turning movement of said bell crank lever upon movement of said guide means with said sewing machine clamp means, the sprocket wheel

journaled in said bell crank lever being shiftable in response to movement of said guide means to change the length of the link-belt path.

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