

[54] SEWING MACHINE CUTTING MECHANISM

[75] Inventor: John L. Rockerath, Utica, N.Y.

[73] Assignee: Jetsew, Inc., Barnevald, N.Y.

[22] Filed: July 30, 1973

[21] Appl. No.: 383,991

Related U.S. Application Data

[60] Division of Ser. No. 260,163, June 6, 1972, Pat. No. 3,760,748, which is a continuation-in-part of Ser. No. 153,664, June 16, 1971, Pat. No. 3,763,800.

[52] U.S. Cl. 112/130

[51] Int. Cl. D05b 37/04

[58] Field of Search 112/130, 129, 122, 126, 112/252, 121.11, 121.15; 83/356.2

[56] References Cited

UNITED STATES PATENTS

3,163,136 12/1964 Pickett..... 112/130

3,696,765 10/1972 Bernewasser 112/130 X
3,722,435 3/1973 Elsas 112/121.11

Primary Examiner—H. Hampton Hunter

Attorney, Agent, or Firm—Prutzman, Hayes, Kalb & Chilton

[57]

ABSTRACT

A sewing machine having a cutting mechanism, an override control mechanism operable for positively controlling the advance of material past the cutting mechanism, and sensing means for sensing the presence of material upstream of the cutting mechanism for actuating the override control mechanism to effect automatic feeding of material past the cutting mechanism in synchronism with the operation of the cutting mechanism.

7 Claims, 8 Drawing Figures

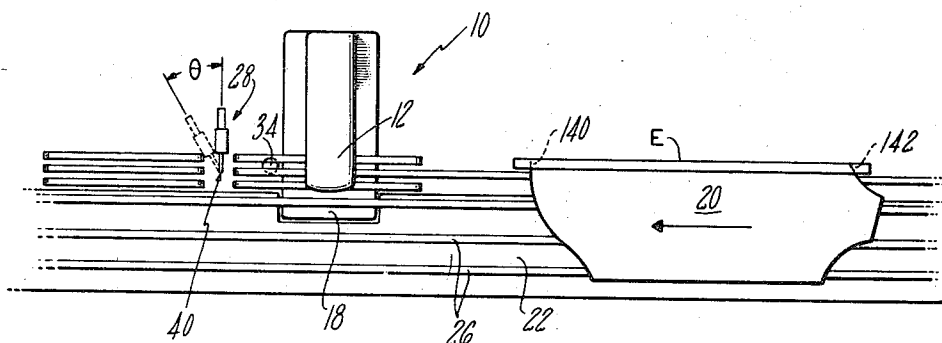


FIG. 3

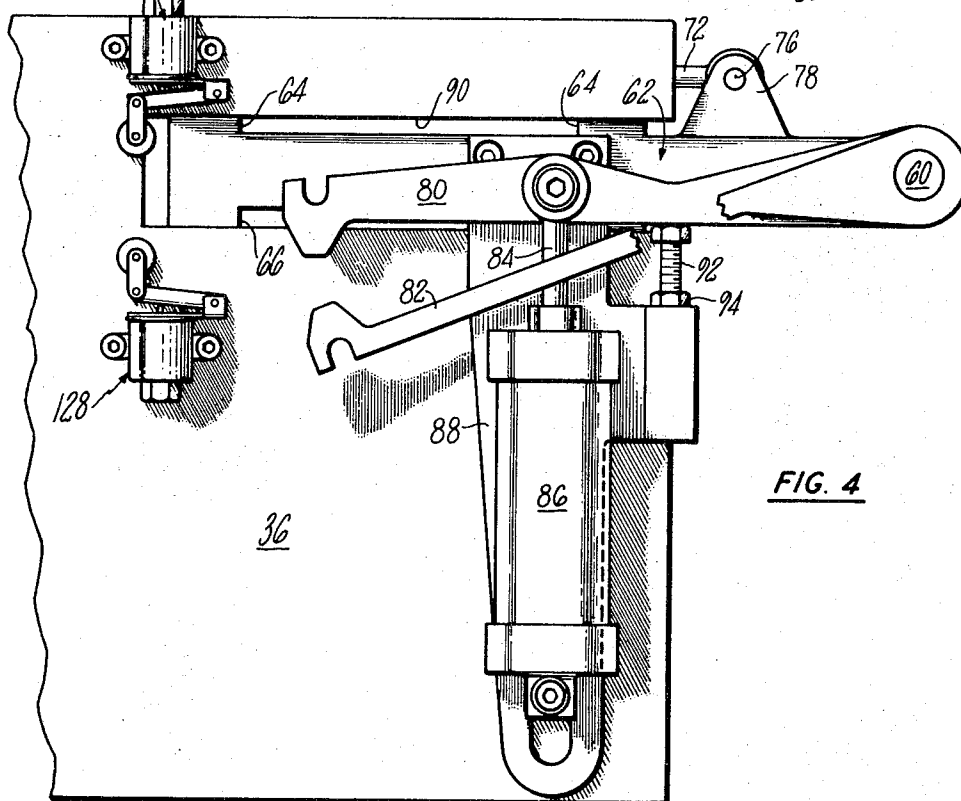
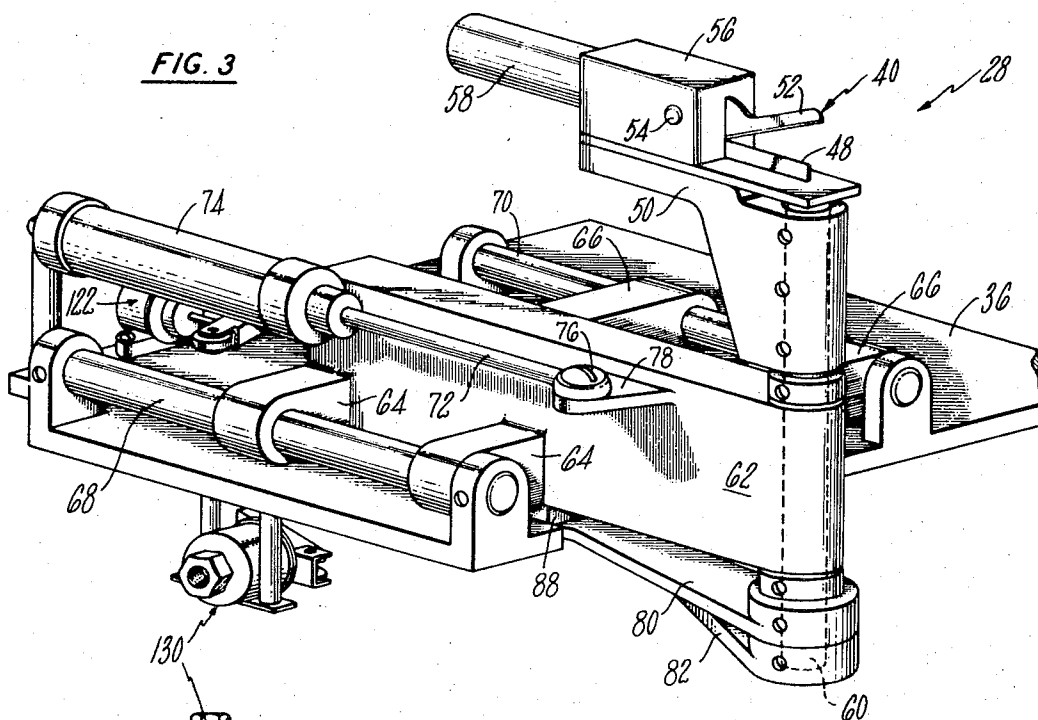
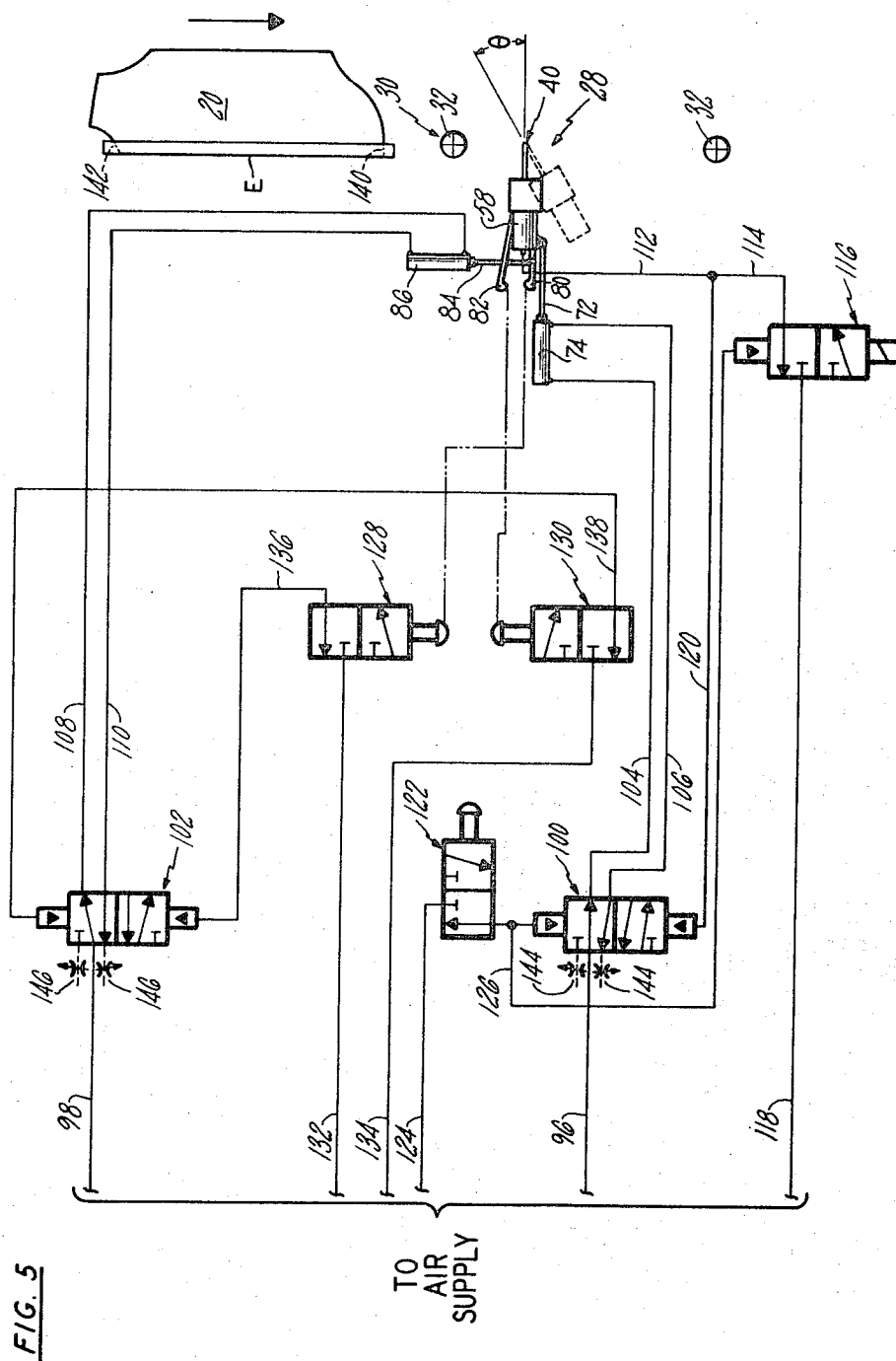
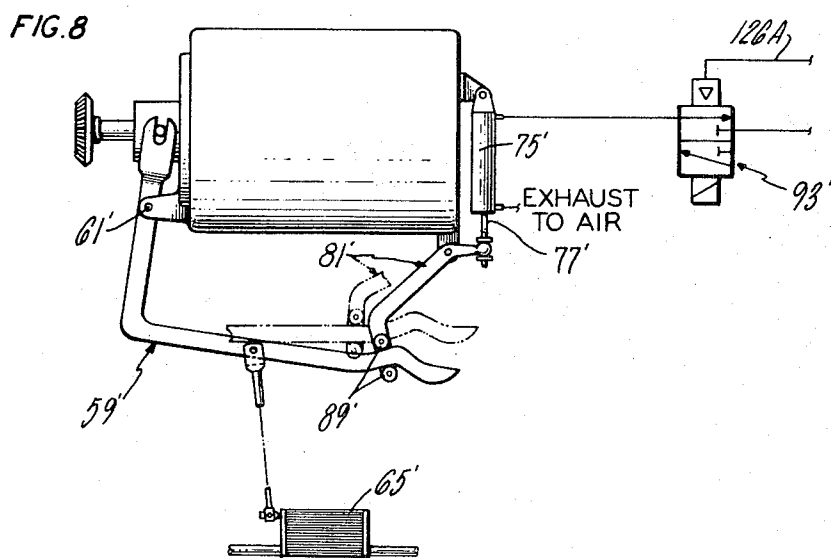
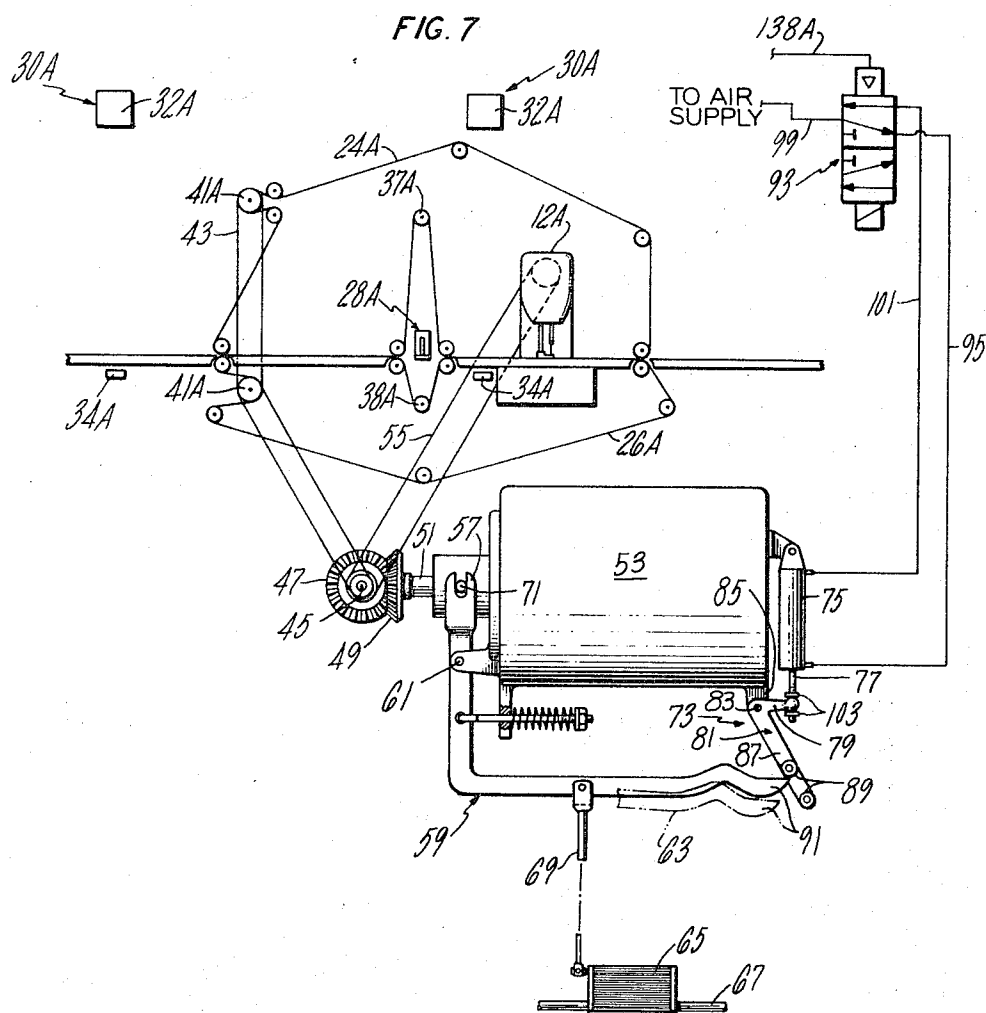


FIG. 4





SEWING MACHINE CUTTING MECHANISM

This is a division of application Ser. No. 260,163, filed June 6, 1972, now U.S. Pat. No. 3,760,748 dated Sept. 25, 1973 which application is a continuation-in-part of applicant's U.S. Pat. application Ser. No. 153,664 entitled Retractable Sewing Machine Cutting Mechanism, filed June 16, 1971 now U.S. Pat. No. 3,763,800 dated Oct. 9, 1973.

This invention generally relates to sewing machines and particularly concerns an improved cutting mechanism for a sewing machine.

A primary object of this invention is to provide an improved sewing machine cutting mechanism capable of automatically varying the angle at which material is cut on alternate cutting operations.

Another object of this invention is to provide a cutting mechanism of the above-described type particularly suited to be incorporated in either new or existing sewing machines and which is automatically operated in timed relation to the passage of material along its feed path in an automated sewing and cutting operation.

A further object of this invention is to provide such a cutting mechanism usable in a sewing machine for cutting material at different predetermined angles while virtually eliminating any possibility of buckling of the material and undesired jamming of the machine even though material of different sizes and varying layers are being fed through the machine to be stitched and cut.

A still further object of this invention is to provide a sewing machine incorporating a cutting mechanism of the above described type and a controlled drive system for advancing material past the cutting mechanism in synchronism with its operation to ensure accurate cutting of material by the cutting mechanism.

A still further object of this invention is to provide such a machine which effects controlled feed of material past the cutting mechanism to minimize the possibility of operator error being introduced and precludes such mistake by an operator by the provision of a new and improved override control mechanism automatically operable in synchronism with the cutting mechanism for precision material feeding and cutting at the cutting station.

Still another object of this invention is to provide an improved belt feeding system for positive control of material being fed in a sewing machine of the above described type.

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

A better understanding of the objects, advantages, features, properties and relationships of the invention will be obtained from the following detailed description and accompanying drawings which set forth an illustrative embodiment and is indicative of the way in which the principle of the invention is employed.

In the drawings:

FIG. 1 is a side view, partly broken away, schematically illustrating a sewing machine incorporating this invention;

FIG. 2 is a plan view, partly broken away, of the machine of FIG. 1 showing material being fed along its feed path to the machine;

FIG. 3 is an enlarged isometric view, partly broken away, of a cutting mechanism incorporated in the machine;

FIG. 4 is an enlarged bottom view, partly broken away, of the cutting mechanism of FIG. 3;

FIG. 5 is a view, partly broken away, schematically illustrating a typical fluid control circuit for the cutting mechanism;

FIG. 6 is an enlarged isometric view showing another embodiment of a cutting mechanism knife;

FIG. 7 is a side view, partly broken away, schematically illustrating an override control mechanism in another embodiment of a sewing machine incorporating this invention; and

FIG. 8 is a fragmentary side view, partly broken away, schematically illustrating a different type of override control mechanism which may be employed in the machine of FIG. 7.

Referring to the drawings in detail wherein a preferred embodiment of this invention is illustrated, a sewing machine 10 is shown having a conventional sewing machine head 12 supporting a needle bar 14 and presser foot 16 above a support plate 18 which will be understood to be secured to a conventional machine frame, not shown.

Material (which if desired may be of a varying number of layers) such as the illustrated shirt front 20 is fed along a feed path in the direction of the arrow in FIG. 2 to be stitched and cut. The feed path is established in part by work supporting surfaces such as at 22. For positively controlling the advance of material, laterally spaced pairs of narrow, opposed, upper and lower high-speed conveyor belts or tapes 24, 26 are provided for conveying the material directly to the stitching station at the sewing machine head 12. From there, the material between the tapes 24, 26 is fed to a cutting mechanism 28 incorporated in the machine 10 of this invention and shown for illustrative purposes in downstream relation to the stitching station.

The sewing machine head 12 may be operated by suitable automatic controls, not shown, in accordance with conventional techniques to apply a suitable line of stitching to the material 20 passing through the stitching station, and thereafter the stitching operation may be automatically interrupted upon passage of the trailing edge of the material through the head 12 of the machine 10.

Suitable photoelectric devices such as at 30 may be provided for actuating a cutting operation at the cutting station responsive, e.g., to the leading edge of the material passing into and out of the cutting station. It will be sufficient for an understanding of this invention to state that an output signal for initiating automatic operation of the cutting mechanism 28 may be produced by interrupting light which normally falls between the tapes 24, 26 from overhead light sources such as at 32 onto underlying photocells such as at 34 for cutting leading and trailing edge portions, e.g., of the material in timed relation to its passage through the cutting station.

The cutting mechanism 28 has a frame 36 (FIG. 3) suitably secured to the machine frame, not shown, and a cutting means illustrated as a scissors type knife assembly of knife 40 is operably mounted on the frame 36 at a height corresponding to the feed path of the material. The knife 40 is shown (FIGS. 1 and 2) located in noninterfering relation to the upper and lower tape systems in a gap within the feed path of the material which is established by offset idler rollers 37 and 38 about which the upper tapes 24 and lower tapes 26 are

respectively trained. Thus, as the material 20 is fed between the tapes 24, 26, the upper and lower tape systems may be driven by a common variable speed drive, now shown, or by any other type driving arrangement which would rotate the feed rollers, such as at 41, at a desired rotary speed. The actuation of the knife 40 by the photoelectric material sensing devices 30 is accordingly synchronized with the relative speeds of the tapes 24, 26 and the corresponding speed of travel of the portions of the material 20 to be cut.

The illustrated knife 40 includes a fixed blade 48, secured to a knife support arm 50, and a relatively movable blade 52 supported for pivotal movement about a horizontal pivot shaft 54 fixed to a housing 56 on the arm 50. An outer free end of the movable blade 52 is thus mounted for movement in a vertical plane toward and away from the fixed blade 48 between a relatively closed position and a relatively open position best seen in FIG. 3. The knife 40 may be desirably actuated by any suitable means but in the illustrated embodiment, its movable blade 52 will be understood to be operated by a piston, not shown, of a power cylinder 58 illustrated as a standard air cylinder secured on the support arm 50 to extend rearwardly of its housing 56. When compressed air is introduced to the cylinder 58, its piston is thrust forward to move blade 52 into closed position to effect an excellent cutting action. Upon exhausting air from cylinder 58, its piston will be understood to be spring returned to move blade 52 back into open position.

For selectively varying the angle of cut of the material 20 being fed through the machine 10 in accordance with this invention, while at the same time ensuring that the depth of cut relative to a side edge E of the material remains constant regardless of the angle of cut, the knife 40 is supported on arm 50 for swinging movement about a vertical axis established by an upright pivot shaft 60 fixed to arm 50 and extending downwardly from its extreme forward end. The pivot shaft 60 is mounted for rotation on an extreme forward end of an elongated, horizontally disposed slide or carrier 62 with the free ends of the knife blades 48, 52 positioned in substantially coaxial alignment with the axis of pivot shaft 60.

So that the knife 40 may be immediately retracted after a cutting operation, to minimize any undesired buckling of the material 20, and thereafter be repositioned adjacent the feed path of the material for a subsequent cutting operation, the carrier 62 is mounted for linear of the material. Carrier 62 is shown having laterally extending lugs such as at 64 and 66 respectively, supported and guided for movement along a pair of horizontally disposed carrier rods 68 and 70 fixed to the frame 36 of the cutting mechanism 28 on opposite sides of the carrier 62.

In the specifically illustrated embodiment of this invention, carrier 62 is advanced and retracted with a reciprocating motion by extension and retraction of a piston rod 72 of a conventional double-acting air cylinder 74 rigidly secured in a horizontal position to the frame 36. The piston rod 72 is connected by a fastener 76 to a thrust plate 78 intermediate the ends of carrier 62. If desired, the stroke length of piston rod 72 may be adjusted in accordance with conventional techniques for readily varying the extent to which the knife 40 is positioned in the feed path of the material to be cut and thereby to vary the depth of cut.

By virtue of the above-described structure, the knife 40 not only is supported for reciprocating movement with the carrier 62 into and out of the feed path of the material 20 but is also desirably supported for swinging movements independently of the carrier 62 in a horizontal plane in opposite angular directions about pivot shaft 60.

To provide such swinging movements of the knife 40, a pair of horizontally extending, vertically spaced, switching arms 80, 82 are rigidly fixed in angularly offset relation to one another on a lower end portion of pivot shaft 60 extending below carrier 62, and arm 80 is shown drivingly connected to a piston rod 84 of a standard double-acting air cylinder 86. Cylinder 86 is mounted below frame 36 on an underlying support plate 88 secured to the bottom of the carrier 62 and extending laterally outwardly therefrom through a cutout portion 90 of frame 36. Both arms 80, 82 are accordingly moved in unison in opposite angular directions responsive to extension and retraction of piston rod 84, whereby pivot shaft 60 and knife 40 are swung through an angular displacement established by appropriate limit stops.

The angular displacement of knife 40 as shown in FIGS. 2 and 5 extends through an angle θ from a straight cutting position of the knife 40 (illustrated in full lines) to an inclined cutting position (represented by broken lines). While the stroke length of the piston rod 84 obviously may be adjusted by any suitable means, the preferred embodiment utilizes cylinder 86 as a stop for the piston rod 84 in its fully extended position to establish a limit position for knife 40 in an inclined cutting position. A limit position in the opposite angular direction is shown in FIG. 4 provided by fastener 92 threadably connected to the underlying cylinder support plate 88 and secured in an adjusted position by a lock nut 94, whereby retraction of the piston rod 84 repeatedly locates knife 40 in a second selected position relative to the material such as the illustrated straight cutting position of the knife 40.

When it is desired to sequentially cut material being fed through the cutting station at varying angles of cut, by virtue of the above-described construction, the sewing machine cutting mechanism 28 of this invention is particularly suited for a completely automated sequence of operations governed by movement of carrier 62.

For this purpose, a suitable fluid control circuit is provided as best seen in FIG. 5 wherein USA Standard fluid power graphic symbols are employed. Compressed air from an external source, not shown, is supplied through fluid supply lines 96, 98 to a pair of pilot actuated, two-position, four-way, five ported pneumatic signal control valves 100, 102 respectively controlling operation of air cylinder 74, 86 for longitudinally positioning the carrier 62 and angularly positioning the knife 40. Control valves 100, 102 each have cylinder ports connected through suitable tubing 104, 106 and 108, 110 to opposite ends of the double-acting cylinders 74 and 86. In FIG. 5 the cylinder 74 (for reciprocating the carrier 62) is shown in a normal extended position, and the cylinder 86 (for adjusting the angular position of the knife 40) is shown in a normal retracted position to locate knife 40 in a first angular cutting position which in the preferred embodiment is shown as being its straight cutting position. As previously described, knife 40 is normally open when its power cylinder

der 58 is connected to exhaust as seen in FIG. 5, wherein cylinder 58 is shown connected by tubing 112 to a common outlet passage 114 leading to a two-position, three-way solenoid operated valve 116.

When carrier 62 is in its normal extended position with knife 40 normally open and in its straight cutting position, the axis of pivot shaft 60 and, accordingly, the free ends of blades 48, 52 are positioned at a preselected depth of cut in the aforementioned gap in the feed path of the material 20, preferably in line with photoelectric devices 30 which will be understood to control actuation of the solenoid operated valve 116 in timed relation to passage of material 20 past knife 40.

Upon photoelectric actuation of the solenoid operated valve 116 responsive to the leading edge of material 20 entering the cutting station, compressed air from a fluid supply line 118 is introduced into power cylinder 58, closing knife blade 52 and severing the leading edge of the material 20. Simultaneously, the carrier positioning control valve 100 is actuated via a fluid line 120 communicating with the common outlet passage 114, whereupon the air connections to cylinder 74 are reversed. Piston rod 72 is then automatically retracted and carrier 62 is immediately withdrawn away from the feed path of the material 20 into a retracted inoperative position, thereby minimizing any possibility of buckling of material passing through the cutting station and to effectively minimize any shutting down of the machine 10 due to jamming.

Withdrawal of carrier 62 automatically actuates a lever operated two-position, three-way switching valve 122 connected by a line 124 to the air supply to pressurize a fluid line 126 leading to a pilot actuator of solenoid operated valve 116. Valve 116 thereby shifts into its normal position and is reconditioned for subsequent photoelectric actuation while also venting power cylinder 58 to permit its piston rod to be spring returned to ensure that blades 48, 52 are open prior to knife 40 being power returned into the feed path of the material when carrier 62 is repositioned in its normal extended position. In this regard, actuation of switching valve 122 simultaneously shifts carrier positioning control valve 100, again reversing its fluid connections to cylinder 74 and extending its piston rod 72 to automatically power return carrier 62 into normal extended position in preparation for the next cutting operation.

During retraction of carrier 62, the angularly offset arms 80 and 82 alternately trigger lever operated two-position, three-way pilot actuating valves 128 and 130. Valves 128 and 130 have supply lines 132 and 134 leading to the air supply and which are respectively connected upon valve actuation to lines 136 and 138 leading to pilot actuators of the knife positioning control valve 102.

Accordingly, during the above-described retraction of carrier 62 after knife 40 has made a straight cut in the leading edge of the material as shown by the broken lines 140, arm 80 triggers pilot actuating valve 128 to shift knife positioning control valve 102, reversing the connections to the double-acting air cylinder 86 to extend its piston rod 84. Extension of piston rod 84 rotates arms 80, 82 and knife 40 via the interconnecting pivot shaft 60 through a preselected angle determined by the previously described limit stops to position knife 40 in inclined cutting position. This angular rotation occurs about the pivotal axis of the shaft 60 which is

thereafter automatically relocated in alignment with the scan line of the photoelectric devices 30 in the path.

As the trailing edge of the material passing into the cutting station is sensed by the downstream photoelectric device 30, e.g., responsive to the presence of the leading edge of the material, the solenoid operated valve 116 is again actuated to cut the trailing edge of the material along an inclined line of cut as shown by the broken lines 142, and to retract carrier 62 in accordance with the above-described sequence of operations. However, it will be understood that such subsequent retracting movement of carrier 62 then triggers the other pilot actuating valve 130 by means of arm 82, due to the extended position of the piston rod 84, whereby the knife positioning control valve 102 is again shifted to automatically return knife 40 to its original straight cutting position in readiness for cutting a leading edge of a following piece of material.

The speed at which cylinders 100 and 102 travel may be selectively adjusted to correspond with the passage of material past the cutting station by suitable variable flow restriction valves such as shown at 144, 146 installed on exhaust ports of valves 100, 102.

Referring now to FIG. 6, another embodiment of a knife of the cutting mechanism of this invention is shown and will be understood to be mounted as described above in connection with the embodiment of FIGS. 1-5. A relatively movable blade 52a is supported for pivotal movement for rotation about a horizontal pivot shaft 54a. Shaft 54a is fixed to a housing 56a on an arm such as at 50 in FIG. 3. Arm 50 is mounted as described above for free swinging movement in opposite angular directions about a vertical pivot axis for cutting material at different angles on alternate cutting operations. The material, e.g., may be cut in perpendicular relation to the passage of material when the knife 40a is in straight cutting position illustrated in FIG. 6 or, if desired, at selected angles on either side of its straight line cutting position.

To permit uniform depth of cut, the free swinging end of the movable blade 52a will be understood to be located in generally aligned relation to the vertical pivot axis of the knife 40a provided by pivot shaft 60 (FIG. 3) when blade 52a is closed on fixed blade 48a.

To further minimize any tendency toward undesired buckling of material, fixed blade 48a is dimensioned with a length greater than the length of movable blade 52a and is shown as being about twice the length of movable blade 52a in the specifically illustrated embodiment of FIG. 6. By such construction, fixed blade 48a will remain in continuous underlying relation to any material (as at 20a) advancing along the feed path even when knife 40a is withdrawn into its retracted inoperative position as shown in full lines in FIG. 6. Accordingly, extension of its carrier (such as at 62 in FIG. 3) will effect return movement of knife 40a without any tendency of its fixed blade 48a encountering the edge of the material 20a and causing any undesired buckling.

Another embodiment of this invention is illustrated in FIG. 7, wherein like numerals followed by the letter "A" are used to identify like parts generally similar to those previously described in FIGS. 1-5. In FIG. 7, material is conveyed to the stitching and cutting stations by a material feeding apparatus or tape drive system

having upper and lower conveyor tapes 24A, 26A trained about a suitable arrangement of rotary supports (such as at 37A and 38A). Upper and lower drive rollers 41A, 41A are drivably interconnected by a drive belt 43 suitably mounted on a pulley unit of a drive shaft 45 having a bevel gear 47 in meshing engagement with a mating bevel gear 49 fixed to an output shaft 51 of a conventional clutch-brake motor unit 53. To simultaneously rotate the tape drive system and also the sewing machine head 12A at the stitching station, the drive shaft 45 is drivably connected to the sewing head 12A via drive belt 55.

The clutch-brake motor unit 53 may be of any desired type adaptable to various modes of control. The specifically illustrated unit 53 is an "Amco 'T-E' clutch motor" sold by Teledyne Amco of Reading, Pennsylvania and which can be selectively actuated into an operative driving position (as depicted by broken lines at 63) and an inoperative braking position respectively upon moving a bifurcated yoke portion 57 of a control lever 59 to the right and to the left as viewed in FIG. 7. That is, upon rotating control lever 59 counterclockwise about pivot pin 61 into its illustrated full line position, an operating pin 71 radially projecting from an axially reciprocable collar into captured relation with the bifurcated yoke portion 57 will cause a braking action to be applied to the output shaft 51. Upon rotating control lever 59 clockwise about its pivot pin 61, operating pin 71 will effect a driving engagement between the output shaft 51 and a shaft of the motor, not shown, within the housing of unit 53, it being understood that drive shaft 51 is axially restrained and gears 47, 49 are in continuous meshing engagement.

The clutch-brake control lever 59 is illustrated as being manually operable by a foot pedal 65 pivotally mounted on a rod 67 and secured to a pivot link 69 connected to control lever 59. By varying the throw of operating pin 71 from its illustrated position to the right as viewed in FIG. 7, the rotary speed of the output shaft 51 will be understood to be proportionally varied with maximum depression of the foot pedal 65 effecting maximum clockwise displacement of the control lever 59 for operating the tape drive system and the sewing head 12A at maximum speed.

In accordance with the embodiment of the invention illustrated in FIG. 7, a positively controlled feed of material along the feed path is established for precisely operating the cutting mechanism 28A in timed relation to the passage of material by the provision of an override control means or mechanism 73 which is automatically actuated responsive to the presence of material at the cutting station thereby to ensure accurate operation of the knife such as at 40a. More specifically, a conventional double acting power cylinder 75 is shown suitably mounted on the clutch-brake unit 53 with an extendible and retractable piston 77 coupled to an arm 79 of a crank 81 supported for swinging movement about a pin 83 secured to a projecting lug 85 on the clutch-brake unit 53. The crank 81 has an elongated swinging leg 87 carrying spaced apart rollers 89 engageable with an arcuate end portion 91 of the control lever 59.

Power cylinder 75 is shown in a normal retracted position wherein compressed air from an external source (not shown) is supplied through a supply line 99 via a solenoid operated valve 93 connected by tubing 95 to one end of the power cylinder 75. With power cylinder 75 in its illustrated normal position, crank 81 is disen-

gaged from the control lever 59. When a leading end of a sheet of material emerges from the stitching station prior to its entering the cutting station, the material interrupts a light beam from overhead light source 32A (which normally falls between the tapes onto underlying photo cell 34A to act as a sensing means responsive to the presence of material at a predetermined point in the feed path) and photoelectrically actuates both solenoid operated valves 116 (FIG. 3) and 93.

To desirably actuate the override control mechanism 73 before knife 40a is operated to ensure that continued passage of material past the photoelectric device 30A (on the upstream side of cutting mechanism 28A) will be at a given optimum speed as the material enters the cutting station, the compressed air is supplied from line 99 under high pressure through valve 93 and tubing 101 to be introduced into an opposite end of power cylinder 75, extending its piston rod 77 and exhausting cylinder 75 through tubing 95. Such action causes crank 81 to swing clockwise such that its rollers 89 capture end portion 91 of control lever 59 and effectively disable the foot pedal 65 from manually operating clutch-brake unit 53. It will be understood that actuation of the override control mechanism 73 by the compressed air in high pressure line 99 provides a highly responsive action whereby the override control mechanism 73 is operated with less time delay than that encountered in the operation of the power cylinder 58 for operating knife blade 52a.

The arcuate end portion 91 of control lever 59 will be understood to be configured and contoured to ensure engagement by the crank rollers 89 irrespective of the manually selected position of control lever 59 at the time of actuation of the override control mechanism 73. Suitable adjustment nuts such as at 103 are shown for selectively presetting the maximum angular displacement of crank 81 in a clockwise direction upon extension of piston rod 77 whereby a given optimum speed of the tape drive system may be preselected by the resulting operating positioning of control lever 59 which in conjunction with the clutch-brake unit 53 serves as a change speed device. By virtue of the above described construction, the rate at which material passes the cutting mechanism 28A may be readily established to be in timed relation to operation of the knife blade 52a, and the override control mechanism 73 will automatically govern the operation of the change speed device to positively control the advance of material through the cutting station.

Subsequent operation of the machine will be understood to be the same as previously described above in connection with the embodiment of this invention in FIGS. 1-5 which is particularly suited to lend itself to automatic release of the override control mechanism 73, e.g., after the second cut is applied to the trailing edge of the material whereupon continued feeding is permitted under manual control.

More specifically, such override release may be effected after the second cut by operating the pilot actuator of valve 93 upon pressurizing supply line 138A which will be understood to be connected to line 138 (FIG. 5). Line 138 is supplied with compressed air from supply line 134 upon actuation of valve 130 in response to the second retraction of carrier 62 from its inclined cutting position, for example, when arm 82 triggers pilot actuating valve 130. Such action automatically shifts override control valve 93 into its normal

position to retract piston 77 and return crank 81 into its illustrated position in disengaged relation to control lever 59 to permit continued operation of conveyor tapes 24A, 26A and the sewing head 12A by an operator selectively positioning the foot pedal 65.

Obviously, different modes of control can be utilized to achieve different advantages in various types of applications with which this invention is particularly suited to be used. For example, the embodiment illustrated in FIG. 8 may be used when it be desired to completely halt the advance of material through the cutting station for very precise cutting requirements. In FIG. 8, the piston 77' of power cylinder 75' is freely movable responsive to manual operation of control lever 59' with valve 93' in its normal illustrated position. Solenoid actuation of the valve 93' by the photoelectric device 30A (FIG. 7) upstream of the cutting mechanism 28A, for example, causes piston 77' to extend and pivot the crank 81' in a clockwise direction into its broken line position, whereby the control lever 59' is under the control of the two rollers 89', 89' carried on the crank 81' as the power cylinder 75' overrides the manually operated foot pedal 65' to rotate control lever 99' counterclockwise about its pivot pin 61' into an inoperative position (such as that illustrated in full lines in FIG. 7) wherein the brake is applied and the conveyor tapes 24A, 26A and sewing head 12A (FIG. 7) are brought to a stop with the material in position for a cutting operation by the cutting mechanism 28A. Further operation of the machine is effected in accordance with the sequence of operating steps described above in connection with the first embodiment of FIGS. 1-5, and retraction of the carrier 62 is particularly suited to automatically pilot actuate the solenoid operated valve 93' and recondition it to permit a controlled manual feed. For this purpose, a line 126A is connected to a pilot actuator of solenoid operated valve 93' and will be understood to be connected to line 126 (FIG. 5). Withdrawal of carrier 62 accordingly pressurizes lines 126 and 126A upon actuation of the two position three-way switching valve 122, to shift valve 93' back into its normal position to exhaust cylinder 75' on both sides of its piston (which is connected to rod 77') to again permit manual control over the feeding and driving system of the machine.

It will be noted that the above described construction provides the further advantage of ensuring sufficient time delay for pressure build-up within the carrier positioning control cylinder 74 (FIG. 5) to return the knife 52a in condition for the next cutting operation. As the leading end of the material advances further to interrupt the light beam between the next photoelectric device 30A downstream of the cutting mechanism, the solenoid operated valve 93' is again photoelectrically actuated to automatically override the foot pedal control and again bring the drive system to a complete stop for the next operation of the cutting mechanism 28A. Once again, retraction of the carrier 62 reactuates the switching valve 122 and the power cylinder 75' of the override control mechanism is again exhausted permitting the operator to resume manual control by means of the foot pedal 65'.

A sewing machine cutting mechanism constructed in accordance with this invention is particularly suited to be adapted for a completely automated sequence of operations whereby varying angles of cuts limited to a predetermined depth of cut may be selectively adjusted

and sequentially effected by a suitable knife in a high-speed production operation. Undesired buckling of material is effectively minimized by substantially instantaneous retraction of the knife upon its being operated to cut the material passing through the cutting station. Either new or existing sewing machines may be readily adapted to incorporate the cutting mechanism herein described which is of relatively simplified but rugged construction and which is economical to both manufacture and assemble to effect efficient combination sewing and cutting operations characterized by a significantly reduced required time cycle.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

I claim:

1. In a sewing machine having a cutting station in a feed path of material to be sewed, a cutting mechanism comprising a frame including a knife carrier mounted thereon for reciprocating movement laterally toward and away from the feed path respectively between a normal extended position and a retracted inoperative position, a knife support having a vertical pivot shaft rotatably supported on the carrier, a scissors-type knife including a movable blade operatively mounted on the knife support for movement about a generally horizontal pivot axis and a fixed blade secured to the knife support, the fixed and movable blades being supported for swinging movement with the knife support about its vertical pivot shaft for varying the angle of the knife relative to the material for a cutting operation, and knife positioning means for angularly rotating the knife support about its vertical pivot shaft and positioning it in a selected angular position to the feed path of the material for a cutting operation, the fixed blade of the knife being of sufficient length that the fixed blade remains in lapping relation to the feed path of the material throughout the operating cycle of the knife carrier during its reciprocating movement between said normal extended and retracted inoperative positions.

2. The cutting mechanism of claim 1 wherein the movable blade terminates in a free swinging end which upon being closed on the fixed blade is generally aligned with the vertical pivot shaft of the knife support to permit uniform depth of cut of the material irrespective of the angle of the knife relative to the feed path of material.

3. In a sewing machine having a cutting station in a feed path of material to be sewed, a cutting mechanism comprising a frame including a knife carrier mounted thereon for reciprocating movement laterally toward and away from the feed path respectively between a normal extended position and a retracted inoperative position, a scissors-type knife supported on the knife carrier, the knife including a movable blade operatively mounted on the knife carrier for movement about a generally horizontal pivot axis and a fixed blade supported in fixed relation to the knife carrier, the fixed blade of the knife being of sufficient length that the fixed blade remains in lapping relation to the feed path of the material throughout the operating cycle of the knife carrier during its reciprocating movement between said normal extended and retracted inoperative positions.

4. The cutting mechanism of claim 3 wherein the fixed blade of the knife is disposed in a plane parallel

11

to but below a plane containing the feed path of material and remains in underlying lapping relation thereto throughout the operating cycle of the knife carrier during its reciprocating movement.

5. The cutting mechanism of claim 3 further including a pivotable knife support having a vertical pivot shaft rotatably supported on the knife carrier, wherein the knife is mounted on the knife support with the fixed blade of the knife secured to the knife support, the fixed and movable knife blades being supported for swinging movement in unison with the knife support about its vertical pivot shaft for varying the angle of the knife relative to the material for a cutting operation.

12

6. The cutting mechanism of claim 5 wherein the movable knife blade terminates in a free swinging end which upon being closed on the fixed knife blade is generally aligned with the vertical pivot shaft of the knife support to permit uniform depth of the cut of the material irrespective of the angle of the knife relative to the feed path of material.

7. The cutting mechanism of claim 5 further including knife positioning means for angularly rotating the knife support about its vertical pivot shaft and positioning it in a selected angular position to the feed path of the material for a cutting operation.

* * * * *

15

20

25

30

35

40

45

50

55

60

65