United States Patent [19]

Hage

[11] **3,777,686**

[45] **Dec. 11, 1973**

[54] **LINEAR ACTION KNEE LIFTERS**

[75] Inventor: **Joseph C. Hage**, New Shrewsbury, N.J.

[73] Assignee: **The Singer Company**, New York, N.Y.

[22] Filed: **June 30, 1972**

[21] Appl. No.: **267,847**

[52] **U.S. Cl.** **112/237**
[51] **Int. Cl.** **D05b 29/02**
[58] **Field of Search** 112/237, 238, 239; 74/89, 99

[56] **References Cited**

UNITED STATES PATENTS

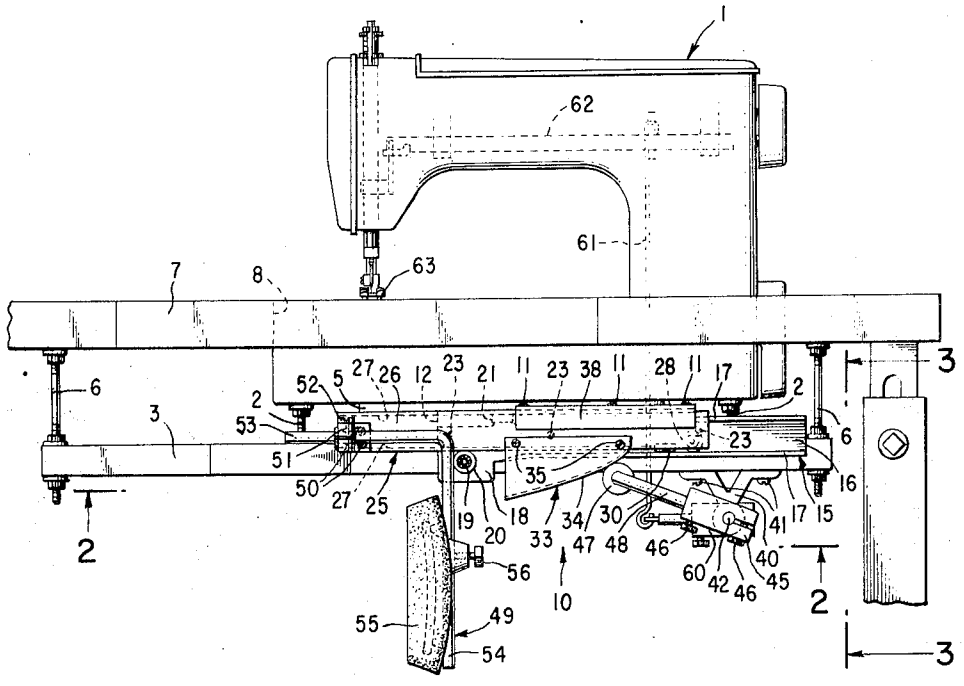
1,668,408	5/1928	Johnson	74/99 R
2,067,038	1/1937	Andres	112/237
2,250,992	7/1941	Kaier	112/237
2,664,841	1/1954	Hale et al.	112/237
3,340,836	9/1967	Goebel	112/237

Primary Examiner—Jordan Franklin
Assistant Examiner—Peter Nerbun
Attorney—Marshall J. Breen et al.

[57] **ABSTRACT**

A knee shift for a sewing machine is disclosed which converts linear motion of a carriage having a kneepad adjustably attached thereto to rotary motion of a rockshaft; which can be used, through suitable linkage and leverage, to actuate an intermittently operating mechanism as for example a presser foot lifter. Two modifications are shown including a ramp and cam follower arrangement wherein the ramp cam surface may be shaped to provide a uniform actuating force with, for example, any given presser lifting device.

6 Claims, 6 Drawing Figures



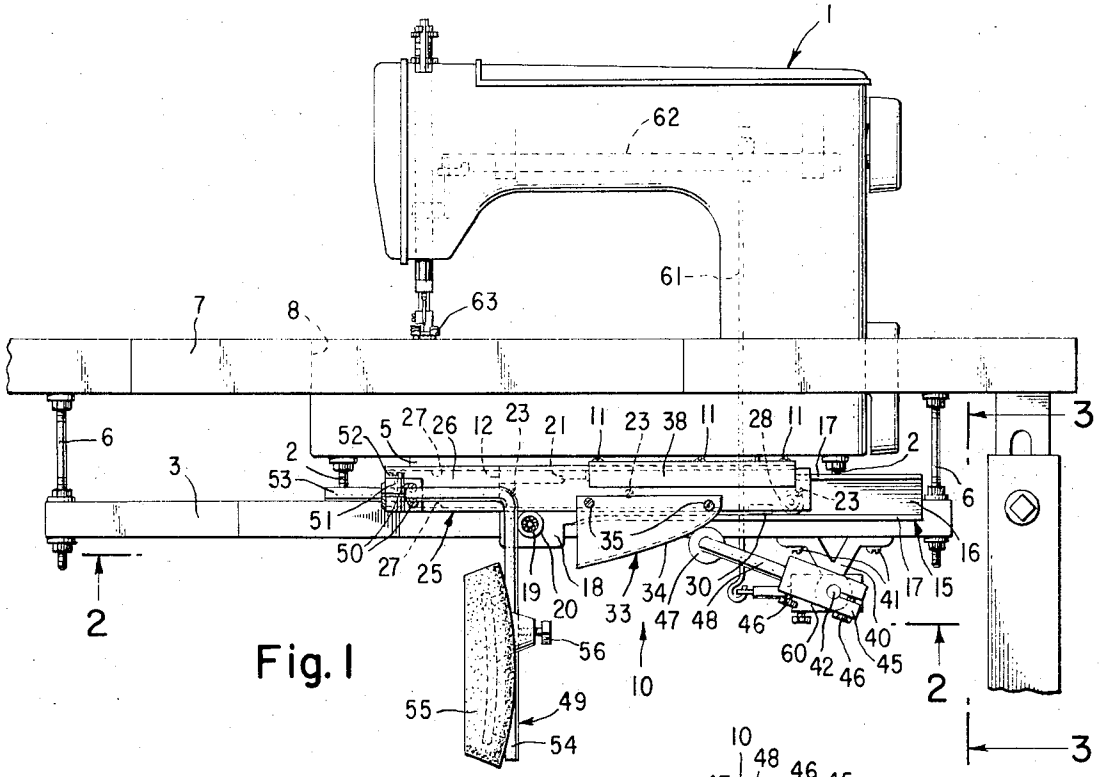

1
62
61
63
7
8
6
3
2
52
5
27
26
12
23
21
11
23
38
11
28
11
17
53
51
50
25
35
19
18
20
33
34
30
47
48
46
41
40
60
42
45
16
15
56
55
49
54
10
3

Fig. 1

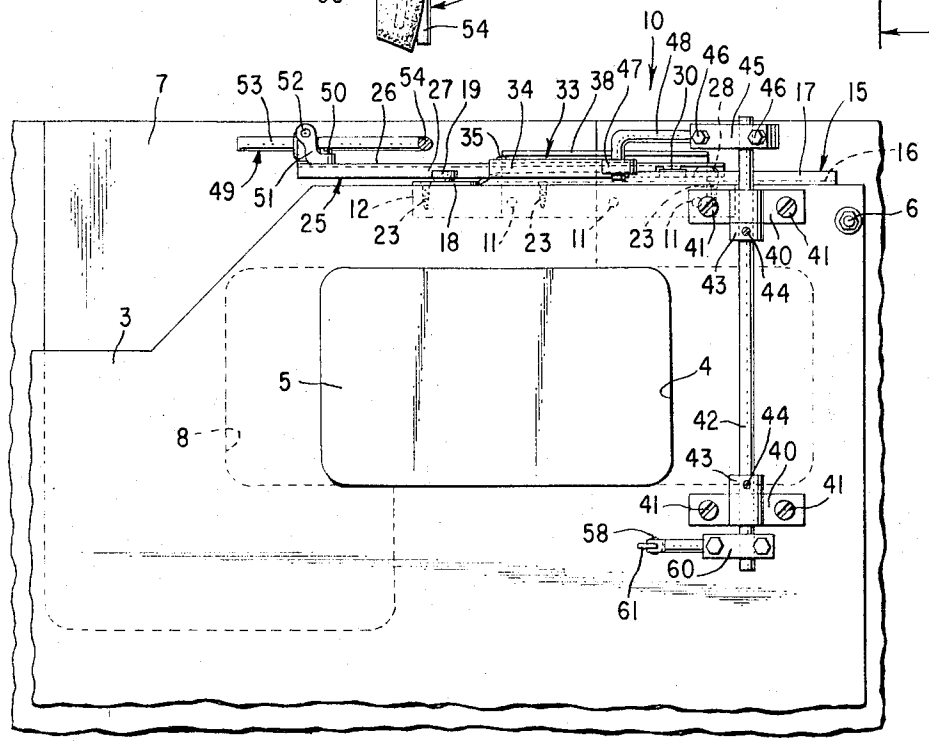

7
53
52
50
26
54
27
19
34
33
38
47
10
48
30
46
28
45
46
17
15
16
49
51
25
12
23
18
11
23
11
23
11
41
40
41
43
44
6
3
5
4
8
42
44
43
40
41
41
58
60
61

Fig. 2

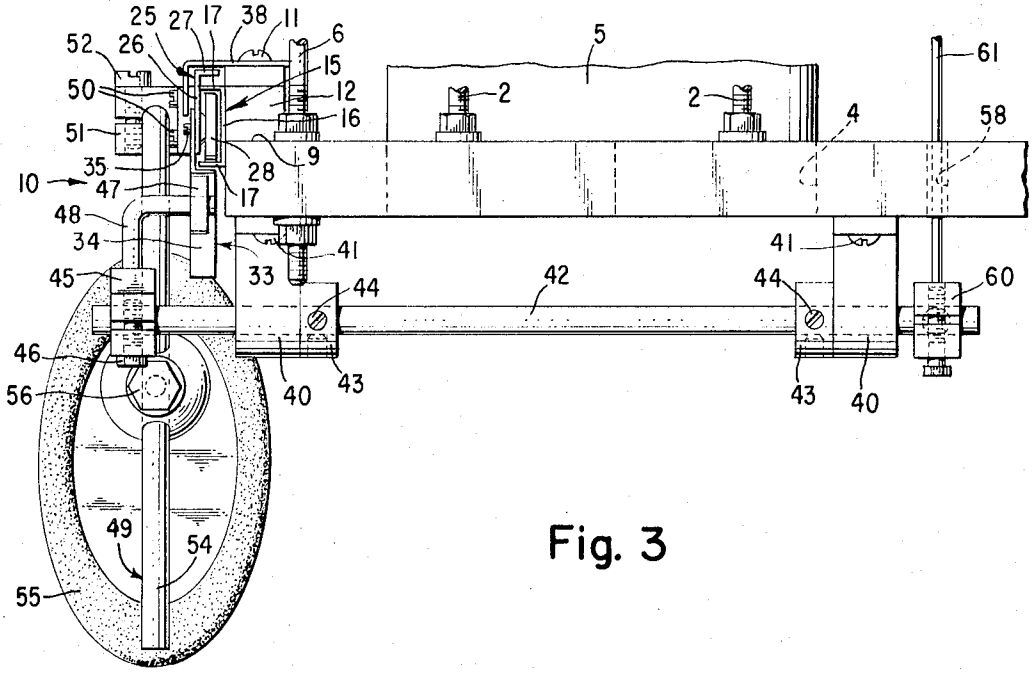

25
27
17
38
11
6
52
26
15
50
12
16
51
9
35
28
10
47
17
48
34
41
45
33
44
42
46
56
40
43
5
2
2
4
61
58
41
44
60
43
40
49
54
55

Fig. 3

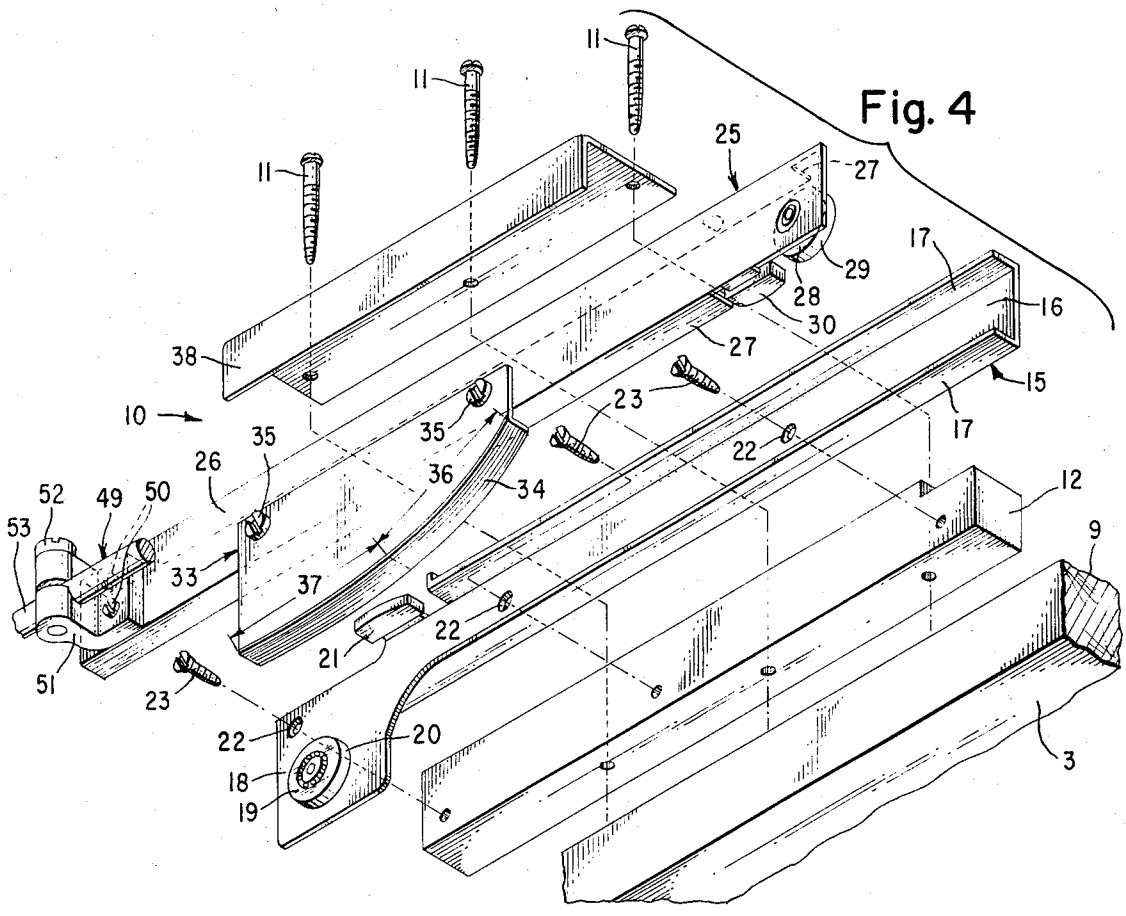

11
11
11
25
27
17
29
28
30
16
38
27
15
10
23
35
35
22
17
26
36
34
12
52
49
50
53
9
33
37
22
21
51
23
22
20
18
19
3

Fig. 4

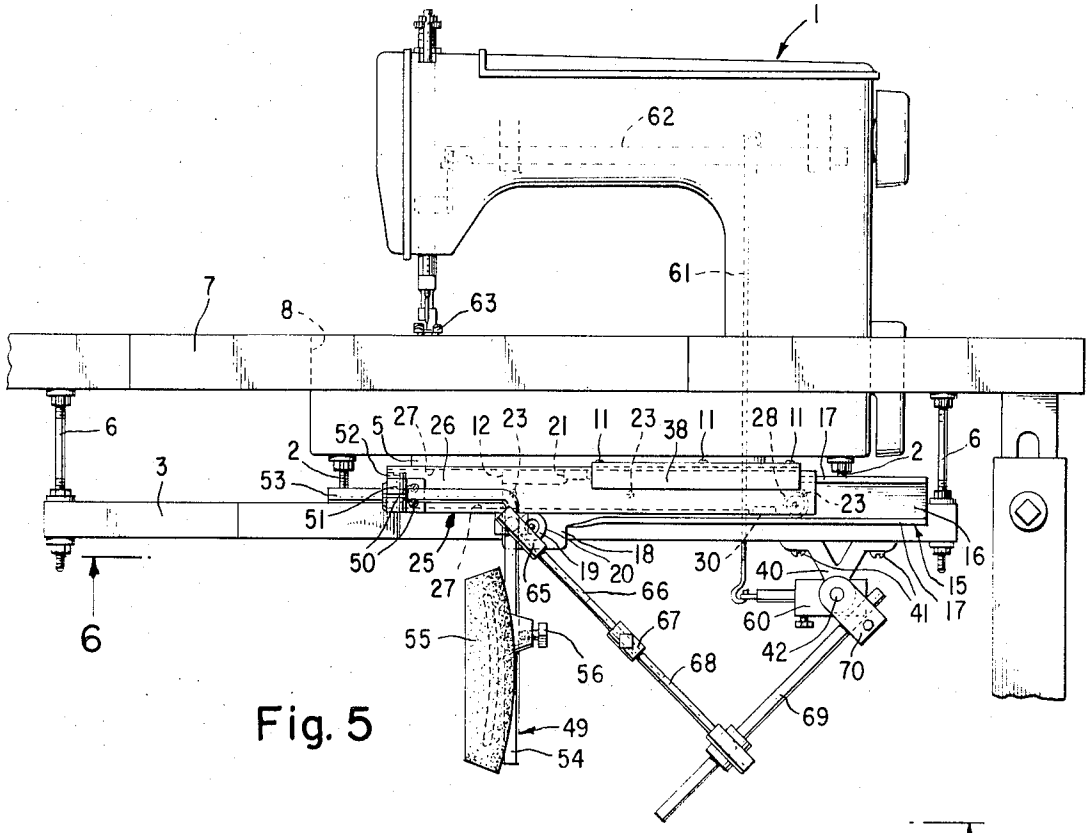

1
62
61
63
7
8
6
3
2
53
52
5
27
26
12
23
21
11
38
28
17
51
50
25
18
19
20
65
66
67
68
69
30
40
60
42
70
16
15
41
55
56
49
54
23

Fig. 5

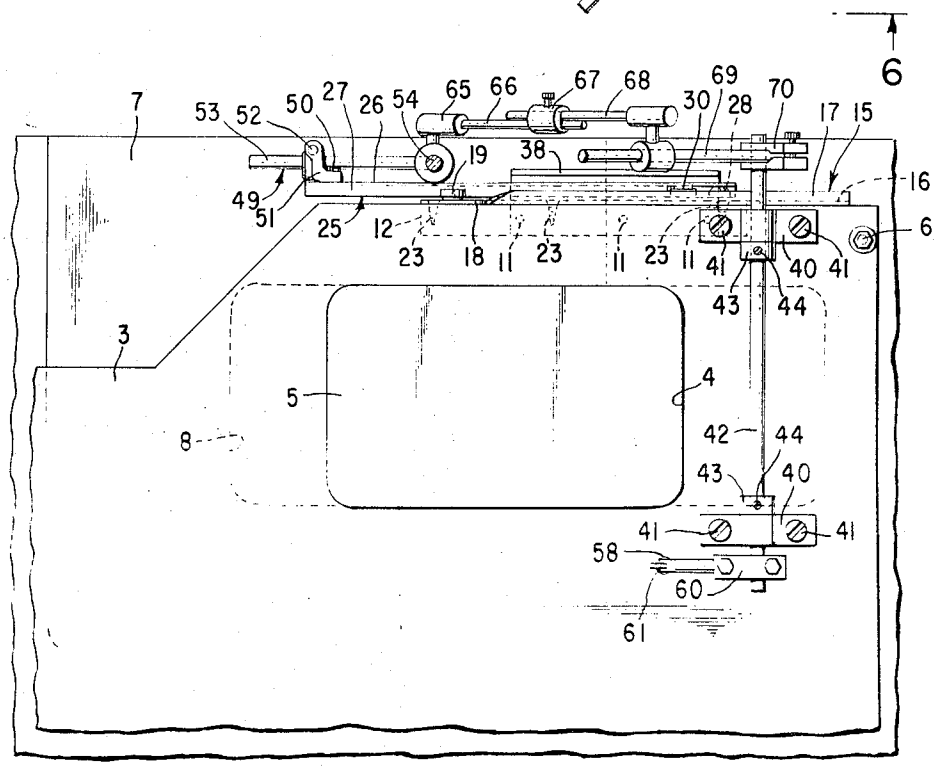

6
7
53
52
50
27
26
54
65
66
67
68
69
30
28
70
17
15
16
6
49
51
25
12
19
38
23
18
11
41
40
43
44
3
5
4
8
42
58
60
61

Fig. 6

LINEAR ACTION KNEE LIFTERS

BACKGROUND OF THE INVENTION

Description of Prior Art

This invention relates to knee shift mechanisms for sewing machines, generally associated with but not limited to presser lifting devices.

Typically, industrial sewing machines are fitted with knee shift devices to enable the operator to raise the cloth presser device without the use of her hands for a variety of purposes including removing the fabric at the end of the sewing operation, repositioning of the fabric after partially completing a seam or for inserting an additional piece of material under the presser device. The advantage of the knee shift is that an operator may raise the presser foot by use of her knee while her hands are otherwise engaged in gripping the fabric or securing a new piece of material to place under the presser foot. It is, therefore, an aid to efficient operation and utilization of the sewing machine.

Heretofore knee shift devices have been proposed which were adjustable to accomodate to the requirements of a particular operator, who may have to manipulate the device many times for each minute of machine operation. Adjustments are generally provided to allow for positioning the kneepad to suit the convenience of tall or short operators. However, the usual presser device being pivoted, the shorter operator, for whom the kneepad is lowered, is required to swing a greater arc while the taller operator, for whom the kneepad is raised, must exert more force. While the inconvenience is not great for occasional operation, the effect of the inconvenience increases out of proportion with increasing use, adding greatly to operator fatigue.

In addition the usual presser device utilizes resilient members, generally coil springs to exert pressure on the fabric. For high speed industrial machines the force required to be exerted is greater than that required for low speed machines in order to overcome the inertia of the presser system which would interfere with proper feeding and sewing. The amount of force required to lift these presser systems is substantial initially and increases rapidly.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a knee shift mechanism for a sewing machine whose force required to actuate is not affected by adjustments made to suit a particular operator.

It is a further object of the invention to provide such a knee shift mechanism which can be tailored to the presser system of a sewing machine so as to require substantially the same force to initially raise the presser foot as to completely raise the presser foot.

The above objects are achieved by means of a knee shift device whose basic movement is along a line instead of through an arc. Horizontal and vertical adjustments are made to the kneepad without affecting the location of the basic movement. Conversion of the linear motion to rotary motion of a rockshaft is obtained through levers or, more desirably, by means of a ramp and cam follower and lever arrangement. In the latter case the cam contour of the ramp may be adjusted to give a high initial rate of displacement of the cam follower with the rate of displacement decreasing to conform with the increasing force exerted by the presser system as the presser foot is elevated to its maximum position.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a sewing machine containing one embodiment of the invention;

FIG. 2 is a bottom plan view of the embodiment shown in FIG. 1;

FIG. 3 is a side view of the embodiment shown in FIG. 1 taken from line 3-3 in FIG. 1;

FIT. 4 is an exploded perspective of the embodiment of FIG. 1 indicating the relative positions of the various parts;

FIG. 5 is a front elevational view of a sewing machine containing a second embodiment of the invention, and;

FIG. 6 is a bottom plan view of the embodiment shown in FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 through 4 an industrial sewing machine 1 is supported on leveling feet 2 by a submerged table 3 having an opening 4 through a sewing machine sump 5 protrudes. The submerged table 3 is supported from a work table 7 by supporting rods 6, the work table 7 having cut out 8 through which the machine 1 extends. Located for convenience on the upper front surface of the submerged table is a knee shift device 10 supported by a supporting block 12 which is affixed to the submerged table by screws 11.

The knee shift device 10 includes a track 15 having a back portion 16 from which protrude two spaced horizontal rails 17. An extension 18 to the left end of the back portion 16 supports a roller 19, the periphery 20 of which projects slightly above the lower horizontal rail 17. A stop 21 is affixed to one end of the upper horizontal rail 17 above the extension 18 to the back portion 16. A pair of holes 22 in the track 15 accomodates a pair of screws 23 to affix the track member to the support block 12.

A carriage member 25 is constructed with a front portion 26 and horizontal rails 27 spaced to nest within the horizontal rails 17 of the track 15. A roller 28 is affixed to the carriage member 25 between the horizontal rails 27 at the right end of the carriage member. The periphery 29 of the roller 28 extends slightly below the lower horizontal rail 27 of the carriage member 25. A stop 30 is affixed adjacent the roller on the lower horizontal rail 27. The carriage member 25 moves within the track 15 supported on one end by the roller 28 contacting the lower horizontal rail 17 of the track member 15. The opposite end of the carriage member 25 is supported by the roller 19 carried by the track member 15. Movement of the carriage to the extreme left position is impeded by the stops 21 and 30, interfering with the rollers 28 and 20 respectively.

A ramp element 33 containing a cam surface 34 is attached by screws 35 to the carriage member 25. A right angle retainer 38 held by screws 11 to the support block 12 retains the carriage member 25 within the horizontal rails 17 of the track 15.

A clamp 51 fastened to the carriage member 25 by screws 50 carries the horizontal arm 53 of a bracket 49 adjustably held in place by clamping screw 52. A kneepad 55 is affixed to the vertical arm 54 of the bracket 49 by means of a clamping screw 56.

Supports 40, affixed to the submerged table 3 by screws 41, provide bearing and support for a rockshaft member 42 in a direction transverse to the carriage member 25. A block 45 adjustably attached to the rockshaft member 42 by screws 46 carries a cam follower 47 at the end of a lever 48 projecting from the block. The block 45 is positioned on the rockshaft member 42 so that the cam follower 47 abuts the cam surface 34 of the ramp element 33. Position of the rockshaft member 42 within the supports 40 is maintained by collars 43 attached to the rockshaft member by screws 44 (FIG. 3).

On the opposite end of the rockshaft member 42 from block 45 is adjustably attached a lever 60. A rod 61 is attached to the end of lever 60 and projects through hole 58 in the submerged table and in the work table (not shown) and extends to a lever depending from a second rockshaft 62 in the sewing machine. Rotation of rockshaft 62 results in elevation of the presser foot 63 of the sewing machine 1.

In operation when the kneepad 55 is shifted toward the right of FIG. 1, the cam surface 34 of the ramp element 33 carried by carriage member 25 deflects the cam follower 47 causing the cam follower to rotate the rockshaft member 42 which through rod 61 rotates the sewing machine rockshaft 62 and elevates the presser foot 63.

The cam surface 34 may be tailored by the characteristics of the presser system of the sewing machine 1 by creating curvatures as indicated in FIGS. 1 and 4. The curvature is designed to give the greatest rotation of the rockshaft member 42 and consequent elevation of the presser foot 63, while the spring pressure of the presser system is relatively low. The greatest change of cam surface 34 therefore occurs in area 36 during the initial motion of the kneepad 55. The rate of change of the curvature in area 37 is considerably less than that in area 36. The induced motion of the presser foot 63 will, correspondingly, be somewhat slower. The net result provided by the curve of cam surface 34 will be to create a uniform force required on kneepad 55 to elevate the presser foot 63.

Many different ramps 33, each having different cam surfaces 34 may be provided with the knee shift device 10 each one of which would be suitable for use with a different type of machine having presser systems with different charactertistics for the purpose of achieving the uniform force desirable on the kneepad.

In FIGS. 5 and 6 is shown another embodiment of the device similar in all respects except without the use of ramp element 33 and cam follower 47. In this second embodiment a rod 66 is attached onto the vertical arm 54 of the bracket 49 through a universal connector 65 affixed to one end of the rod. A second rod 68 also having a second universal connector 65 affixed to one end is joined to this first rod by means of clamp 67 which allows their combined length to be readily changed. The second universal connector 65 is attached to a lever 69 whose end is held in a connection 70 affixed to the rockshaft member 42. In this embodiment adjustments for the horizontal position of the kneepad 55 are accomodated by lengthening or shortening the rods 66 and 68 through loosening of clamp 67 and retightening of this clamp when the proper position of the horizontal arm 53 of the bracket 49 in the clamp 51 has been achieved. Horizontal positioning of the kneepad 55 will have a minimal effect on the amount of force required to actuate the knee shift device 10.

In both embodiments the horizontal positioning of kneepad 55 is achieved by relocating the horizontal arm 53 of the bracket 49 within the clamp 51 attached to carriage member 25. Vertical positioning of kneepad 55 is achieved by relocating the kneepad vertically on the vertical arm 54 of the bracket 49.

Having thus set forth the nature of this invention, what is claimed herein is:

1. A knee shift device for a sewing machine having an intermittently operating mechanism comprising; a track, a carriage member means on said carriage member which constrain it to move along a straight line parallel, said track, a knee shift pad, means securing said knee shift pad to said carriage member, a rockshaft member supported transversely of said carriage member and track and including means adapted for operative connection to said intermittently operated mechanism, and means converting the linear motion of said carriage member to rotary motion of said rockshaft member.

2. A device as claimed in claim 1 wherein the means converting the linear motion of said carriage member to rotary motion of said rockshaft member includes,

a. a ramp element having a cam surface affixed to said carriage member,

b. a cam follower abutting said cam surface of said ramp element,

c. a lever carrying said cam follower and affixed at the end opposite said cam follower to said rockshaft member whereby linear motion of said carriage member will cause rotary motion of said rockshaft member.

3. A device as claimed in claim 2 wherein, said intermittently operating mechanism imposes varying force requirements on the rotary motion of said rockshaft member and said cam surface of said ramp element is shaped to provide that variation in force transmitting angle of contact between said cam surface and said cam follower as to require application of a uniform force on said knee shift pad to meet varying force requirements of said intermittently operating mechanism.

4. A knee shift device as claimed in claim 1 wherein the means securing said knee shift pad to said carriage member includes:

a. a clamp affixed to said carriage member,

b. a bracket composed of two arms each transverse of the other, one of which is secured by said clamp for adjustable positioning along the path of motion of said carriage member,

c. attachment means on said knee shift pad for attach-ing said pad to the other arm of said bracket for adjustment transverse of the path of motion of said carriage member.

5. A knee shift device as claimed in claim 4 wherein the means converting linear motion of said carriage member to rotary motion of said rockshaft member includes;

a. a lever affixed to said rockshaft member, and

b. a linkage pivoted to said bracket and said lever.

6. A knee shift device as claimed in claim 5 wherein said linkage includes a pair of rods, one pivoted to said bracket and the other pivoted to said lever; and a clamp adjustably connecting said rods, whereby movement of said bracket along the path of motion of said carriage member may be accommodated by extending or contracting the clamped length of the rods.

* * * * *

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,777,686 Dated December 11, 1973

Inventor(s) Joseph C. Hage

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 13 insert " , " after member

Column 4, line 15 delete " , " after parallel

Column 4, line 15 insert "to" after parallel

Signed and sealed this 8th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents