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REGULATED PRESSER MECHANISMS FOR SEWING MACHINES

Filed April 14, 1965

2 Sheets-Sheet 1

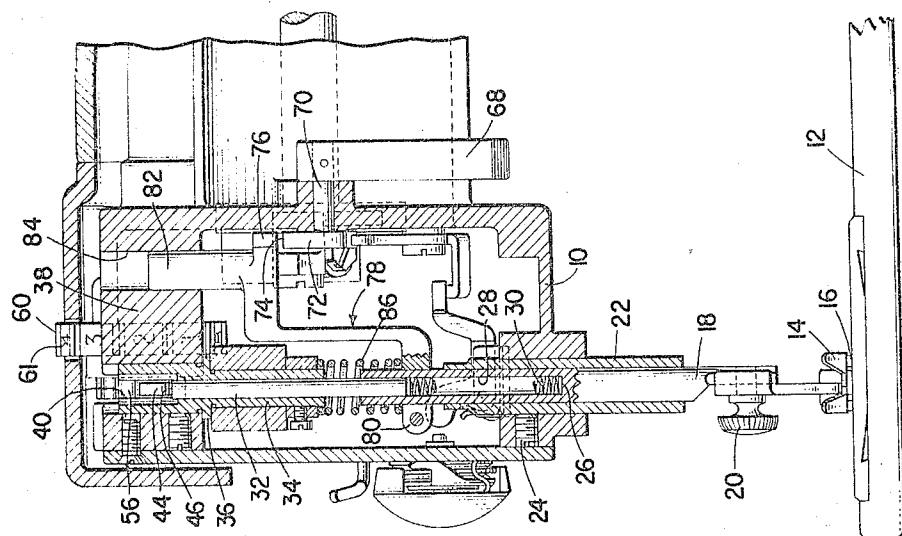


Fig. 2.

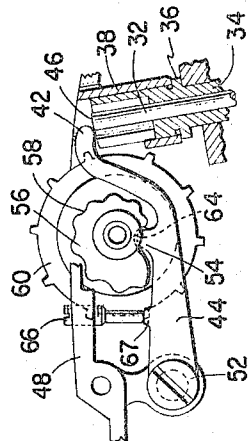


Fig. 4.

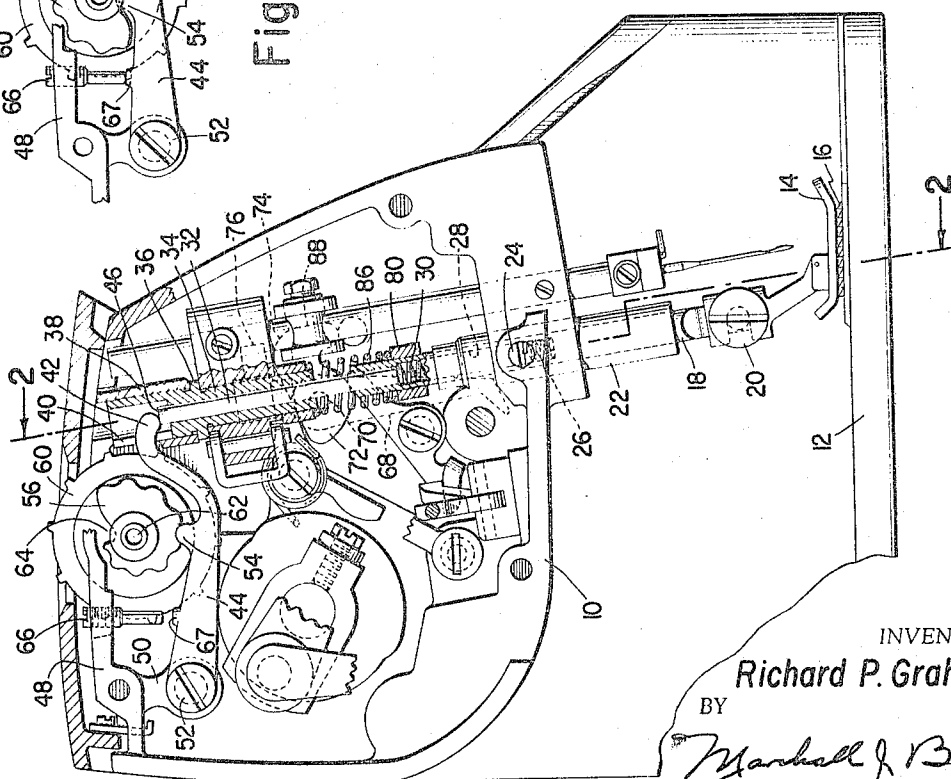


Fig. 1.

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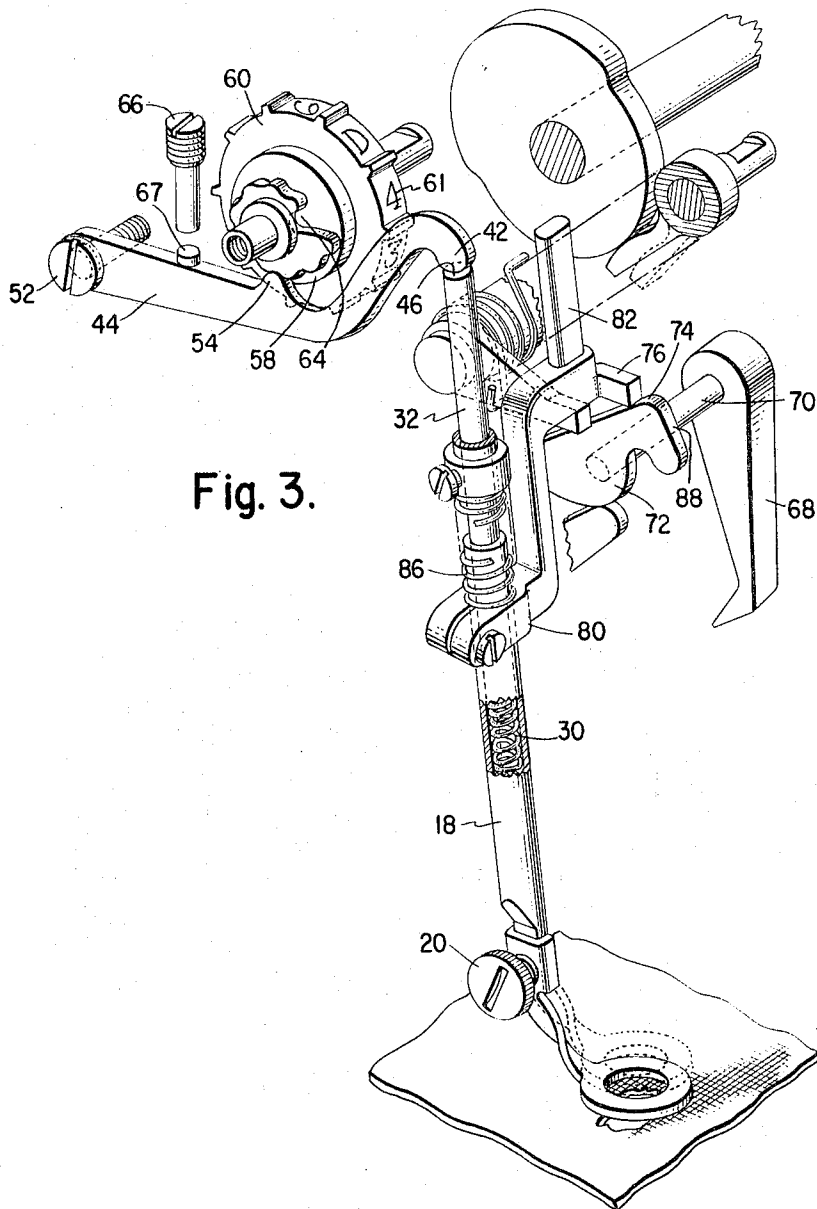


Fig. 3.

WITNESS

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REGULATED PRESSER MECHANISMS FOR SEWING MACHINES

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9 Claims. (Cl. 112—235)

This invention relates in general to sewing machines, and more particularly, the invention provides improved adjustable apparatus for precisely regulating the pressure with which a sewing machine presser-foot is brought to bear against a work-fabric.

In providing the pressure regulation feature of the invention, use has been made of cooperating non-precision parts which are so arranged that they may provide (with considerable exactness) a particular minimal presser-foot pressure as is necessary during certain sewing operations. As a corollary to this, therefore, it may be said that the invention provides manufacturing advantages, whereby quality finished products may be provided at minimal cost. Adjustable mechanisms for regulating the pressure with which a presser-foot engages a work-fabric are well-known in the art (as exemplified by U.S. Patent 3,055,326, issued September 25, 1962, in the name of Robert G. Greulich); and while such mechanisms are useful for most sewing operations, advantages in the sewing machine art, viz. work-fabric positioning apparatus as may be used in the automatic making of buttonholes, have necessitated that an easily settable position of parts be made available, in which the presser foot may be free of the usual spring pressure throughout a precise range of elevation so as to prevent flagging of the work-fabric being sewn, without impeding shift of the work fabric. Presser-foot apparatus embodying the invention provides for a position of parts having the above-noted close dimensional tolerance requirements, and as will become apparent in the following description, such apparatus does so in a way that is compatible with, and makes use of, the general pressure regulation technique described in the above-noted patent.

Accordingly, it is an object of the invention to provide improved apparatus for regulating the pressure with which a sewing machine presser-foot is brought to bear against a work-fabric.

Another object of the invention is to provide an improved way of regulating, to a particular precise dimensional amount, the degree of freedom of a sewing machine presser-foot from the influence of the usual downward spring pressure.

Another object of the invention is to provide apparatus for use in regulating presser-foot pressure, which apparatus employs both a non-precision cam and a cam follower in cooperation therewith, but which cam and follower are so arranged that vertical movement within exceedingly close tolerances may be provided to the presser-foot free of downward spring pressure.

The invention will be described with reference to the figures wherein:

FIG. 1 is a side elevational view, partly in section, of a sewing machine embodying the invention,

FIG. 2 is a front elevational view, partly in section, of the machine depicted in FIG. 1, such view being taken generally along line 2—2 of FIG. 1,

FIG. 3 is a perspective view of the presser-foot pressure regulating mechanism incorporated into the machine illustrated in FIGS. 1 and 2, and

FIG. 4 is a view useful in illustrating the operation of the pressure regulating mechanism of FIG. 3.

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Referring now to the drawings, a sewing machine is shown having a machine frame including a sewing head 10 supported to overhang a cloth supporting plate 12 in conventional manner. A presser-foot 14, the applied pressure of which is variable, is adapted to urge a work-fabric against the teeth of a feed-dog 16, whereby not only may the work-fabric be moved along for continuous sewing, but pressure may be exerted against the work-fabric to prevent flagging. The presser-foot 14 is detachably secured to a presser-bar 18 by means of a knurled screw 20 and the presser-bar 18 is slidably supported in a journal 22 which is itself secured to the sewing head 10 by means of a screw 24. Running along the length of the presser-bar 18 and terminating at a location 26 is an axial bore 28, such bore 28 serving to house a coil spring 30. A spring abutting bar 32, slidably and partially contained within the bore 28, exerts a force (variable in a manner to be described later) against the spring 30 whereby the spring presses against the end 26 of the bore 28 to urge the presser-foot 14 against the work-fabric. The abutting bar 32 is slidably supported in a bushing 34 that is formed with a collar 36 (to prevent axial motion thereof), and such bushing 34 is fixedly secured within a support 38 formed within the sewing head 10.

The support 38 is provided with a slot 40 into which is located the shaped end 42 of a lever 44, and the lever end 42 is brought to bear against the tip 46 of the abutting bar 32. The lever 44 is pivotally secured to a support 48 on the machine frame by means of an arm 50 and a screw 52 serving as a fulcrum for the lever 44. The lever 44 is provided with a cam follower element 54 that cooperates with a spiraled shell cam 56 having as many detents 58 as there are desired discrete pressure settings for the presser-foot 14. The cam 56 is secured to a pressure selector wheel 60 having thereon appropriate pressure representative indicia 61, and the whole wheel-cam assembly is supported, by the sewing head 10, for rotation about an axis 62, whereby the cam 56 and its follower 54 cooperate to cause the lever end 42 to bear more or less against the end 46 of the abutting bar 32 to cause the presser-foot 14 pressure to vary as desired. The selector wheel 60 in FIG. 1 is shown set for an intermediate presser-foot pressure, i.e. the cam follower 54 is shown engaging a detent 58 midway between the extreme ends of the spiraled cam surface, and clockwise and counter-clockwise rotations (looking at FIG. 1) of the selector wheel 60 operate respectively to increase and decrease presser-foot pressure.

The different radii of the detents 58 provide approximately one half inch travel of the lever end 42, and this considerable motion of the lever end can result in a range of presser-foot pressures of approximately 1 to 12 pounds, despite considerable variation in the dimensions of the rod 32, the spring 30 and the bore 28. Since these parts, as well as the support for the lever 44 and for the cam 56, need not be machined to close tolerances in order to provide a completely satisfactory range of presser-foot pressures using the detents 58, the presser mechanism may be produced inexpensively.

When the sewing machine is to be used with a work shifting device other than the feed dog 16, as for instance when buttonholing, darning, or embroidering, it becomes necessary that the presser foot 14 merely rest upon the work with its own weight i.e., the weight of the presser-foot 14, presser bar 18, spring 30 and rod 32 so as not to impede feeding of the work. In this type of sewing the feed dog is deactivated and the presser-foot serves only to prevent movement of the work upwardly with the needle or "flagging" as it is termed in the art. It becomes necessary for this type of sewing that the presser-foot be free of spring pressure until the presser-

foot is raised a predetermined distance, preferably a distance equal to the maximum thickness of work fabric which the sewing machine may reasonably be expected to accommodate.

If one of the detents 58 of the cam 56 is used to provide this setting of the presser mechanism for darning embroidery or buttonholing, i.e., freedom of pressure of the spring 30 for a specific dimensional elevation of the presser-foot, the dimensions of each and every part of the presser mechanism would have to be manufactured to exceedingly close tolerances and the cost of manufacture would become prohibitive.

Accordingly, the present invention proposes that, at a discrete location on the cam 56, a detent 64 be cut which is so deep that the cam follower 54 cannot engage the surface of the cam; then by means of a simple factory-adjustment of a screw 66 threaded through the support 48, the effective depth of the detent 64 may be precisely varied to provide the exact dimension of presser-foot elevation prior to the application of spring pressure as noted above. That is, with the follower 54 sitting in the deeply cut detent 64, the screw 66 is brought to bear against a boss 67 on the lever 44 (see FIG. 4) until the degree of freedom of presser-foot movement is set as desired. Hence, the objects of the invention are achieved.

A lifting mechanism for raising the presser-foot 14 for removal of work-fabric and the like has a lever 68 external the sewing head 10, such lever 68 being secured to one end of a shaft 70 that is rotatably supported by the head 10. The other end of the shaft 70 locates within the sewing head 10 and fixedly supports a cam 72, the knee 74 of which is aligned to bear against a boss 76 located on a member 78. The member 78 is provided with a clamp 80 which fixedly secures the member 78 to the presser-bar 18; in addition, the member 78 is formed with a tang 82 that is adapted to be slidably housed in a slot 84 in the support 38, whereby rotation of the presser-bar 18 about its own longitudinal axis is prevented. A light compression spring 86 i.e., a spring having a very low spring constant may be supported coaxially with the presser-bar 18 so as to bear against the clamp 80. The spring 86 acts to bias the presser-foot 14 downwardly into the position in which it is shown in FIGS. 1 and 2 and provides for a light downward bias upon the presser-foot when the detent 64 is moved opposite to the cam follower 54. To raise the presser-foot 14, the lever 68 is (looking at FIG. 1) rotated counterclockwise, causing the knee 74 of the cam 72 to urge the boss 74 and the presser-bar 18 upward against the compression of the springs 30 and 86; to hold the presser-foot in its raised position, the cam 72 is rotated until its flat portion 88 engages the boss 74; in returning the presser-foot to the position shown in FIG. 1, the lever 68 is rotated clockwise, thereby enabling the springs to relax, and in so doing return the presser-foot 14 to the position shown.

While the invention has been described in its preferred embodiment, it is to be understood that the words which have been used are words of description rather than of limitation and that changes within the purview of the appended claims may be made without departing from the true scope and spirit of the invention in its broader aspects.

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

1. In a sewing machine having a machine frame, a presser-rod pressure regulating mechanism comprising a lever supported by said machine frame, a cam and cam follower in cooperation with said lever for pivotally moving said lever about its fulcrum, resilient means cooperating with and held under tension by said lever for longitudinally urging said presser-rod in a direction tending to relax said tension, the face of said cam being provided with a recess sufficiently deep to prevent contact between said follower and said cam, and adjustable means for use in cooperating with said lever when said follower resides

in said recess to adjust the force by which said lever holds said resilient means under tension.

2. The apparatus of claim 1 wherein said adjustable means is a screw, and wherein said machine frame is provided with a tapped hole therethrough for said screw, said hole in said machine frame being so positioned that said screw may contact and pivotally move said lever about its fulcrum in opposition to the tension in said resilient means.

3. Apparatus for use in regulating the pressure exerted by a sewing machine presser-foot comprising a presser-bar adapted to have said presser-foot secured thereto, means supporting said presser-bar for sliding motion that is substantially in the direction of the longitudinal axis of the presser-bar, resilient means for use in urging said presser-bar slidably in the direction of the end of the presser-bar that is adapted to have said presser-foot secured thereto, and means for varying the tension in said resilient means comprising a pivotable lever adapted to bear against said resilient means, a cam and a cam follower cooperating with said lever to vary the force with which said lever bears against said resilient means, said cam being provided with a detent therein which is sufficiently deep to prevent engagement of said follower with said cam, and adjustable means for use in urging said lever against said resilient means when said follower resides in said detent, whereby an increment of movement of said presser-foot free of tension from said resilient means may be precisely varied.

4. The apparatus of claim 3 wherein said presser-bar is provided with an open bore running part way along the length of said presser-bar toward the end thereof adapted to support a presser-foot, and wherein said resilient means comprises a coil spring constrained coaxially with and within said presser-rod bore, and an abutting bar slidably movable within said bore and bearing against said spring.

5. The apparatus of claim 4 wherein said adjustable means is a screwably variable member that is aligned for pivotally moving said lever against the tension of said constrained coil spring.

6. In combination with a sewing machine, apparatus for varying by discrete amounts the pressure applied by the presser-foot of said machine, one discrete presser-foot pressure level provided being at a particular predetermined low level, comprising a presser-bar having a longitudinal bore that opens at only one of its ends, the other end of said presser-bar being adapted to support said presser-foot, means forming part of said machine for supporting said presser-bar for sliding motion, an abutting bar, a coil spring bearing against said abutting bar and so constrained within said bore by said abutting bar that the longitudinal axes of the bore and said spring are substantially coincidental, part of said abutting bar being slidably supported within said bore, a lever adapted to bear against the end of the abutting bar that is free of said bore to compress said spring and thereby hold said presser-foot under pressure, said lever being pivotally secured to said machine and being formed with a cam follower element, a cam supported by said machine to engage said follower, said cam having a plurality of discretely located detents one of which is sufficiently deep to prevent engagement of the cam and its follower, and screwably adjustable means for use in pivotally positioning said lever against the compressive tension in said spring when said cam follower element resides in said sufficiently deep detent.

7. In combination with a sewing machine, apparatus for varying by discrete amounts the pressure applied by the presser-foot of said machine, one discrete presser-foot pressure level provided being at a particular predetermined low level, comprising a presser-bar having a longitudinal bore that opens only at one of its ends, the other end of said presser-bar being adapted to support said presser-foot, means forming part of said machine for supporting said presser-bar for sliding motion, an abutting

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bar, a coil spring bearing against said abutting bar and so constrained within said bore by said abutting bar that the longitudinal axes of the bore and said spring are substantially coincidental, part of said abutting bar being slidably supported within said bore, a lever adapted to bear against the end of the abutting bar that is free of said bore to compress said spring and thereby hold said presser-foot under pressure, said lever being pivotally secured to said machine and being formed with a cam follower element, a pressure selector wheel having peripherally located pressure representative indicia thereon and being supported for rotation by said machine, a cam secured to said wheel, said cam being situated to engage said follower and having a plurality of discretely located detents one of which is sufficiently deep to prevent engagement of the cam and its follower, a screw, and a brace supported within said machine, said brace having a tapped hole therethrough for said screw that is so positioned with respect to said brace that said screw when in said hole may contact and move said lever pivotally against the com-

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pressive tension of said spring when said cam follower element resides in said sufficiently deep detent.

8. The apparatus of claim 7 including first means for preventing said presser-bar from rotating about its longitudinal axis, and second means for raising said presser-bar from the position needed for sewing.

9. The apparatus of claim 8 wherein said machine is provided with a slot, wherein said first means is a member secured to said presser-bar, said member having a tang thereon adapted to ride in said slot, and wherein said second means comprises a cam, a cam follower on said member aligned with said cam, and a lever for rotating said cam to urge said follower and said member upward.

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