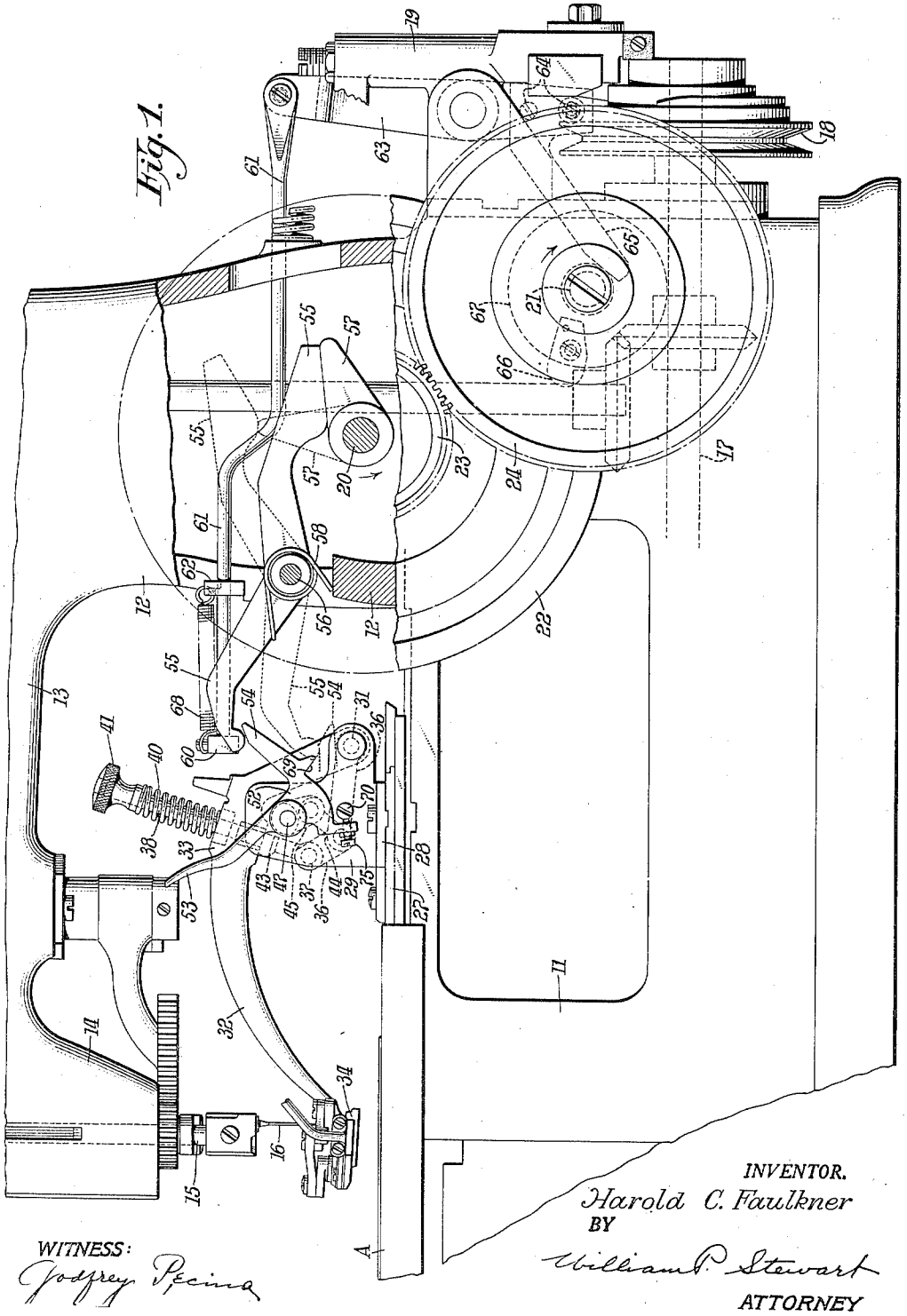
May 30, 1950 H. C. FAULKNER 2,510,014

WORK CLAMPING MECHANISM

Filed Nov. 14, 1947 4 Sheets-Sheet 1

Fig. 1.



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WORK CLAMPING MECHANISM

Filed Nov. 14, 1947 4 Sheets-Sheet 2

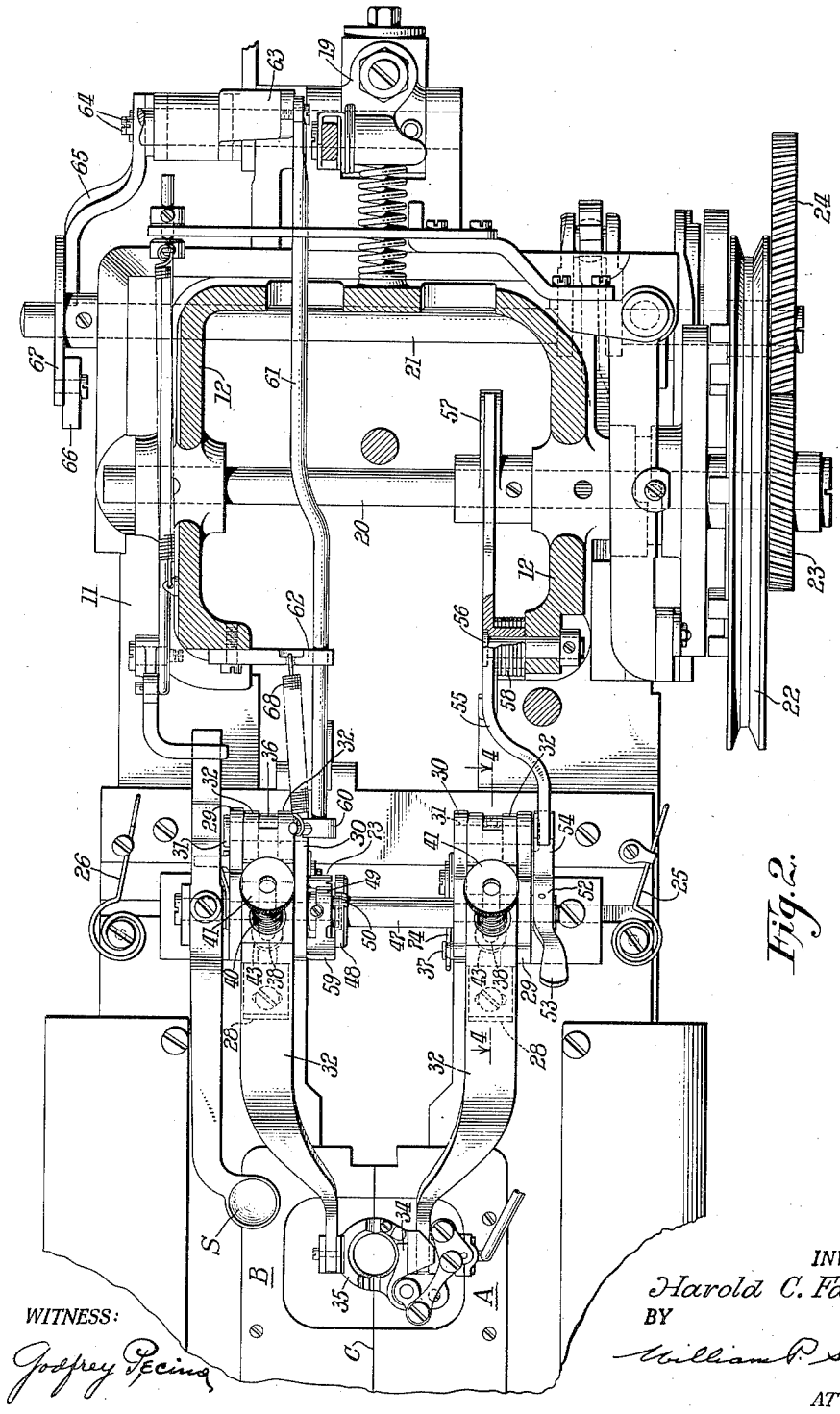


Fig. 2.

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WORK CLAMPING MECHANISM

Filed Nov. 14, 1947 4 Sheets-Sheet 3

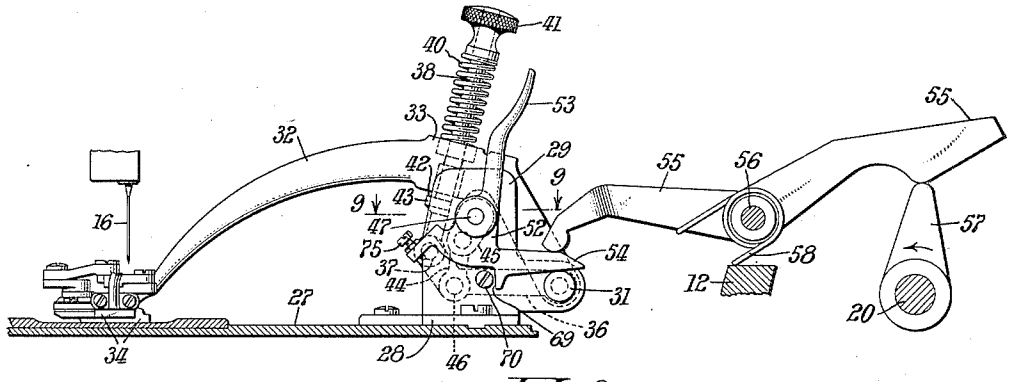


Fig. 3.

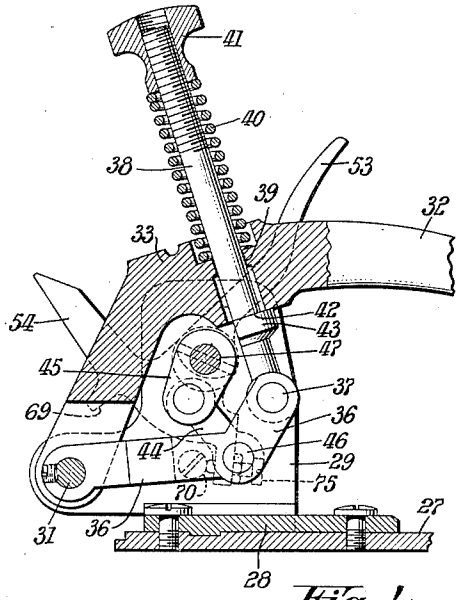


Fig. 4

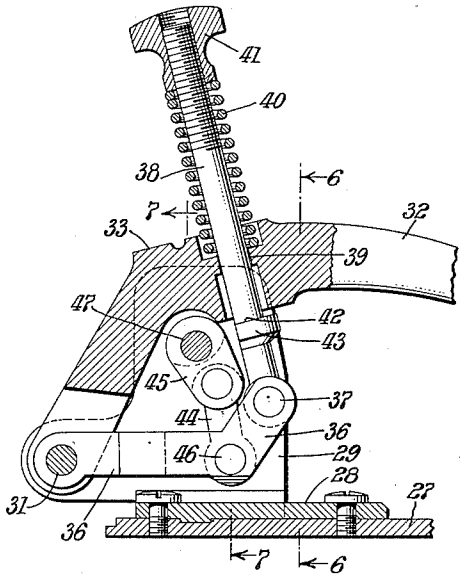


Fig. 5.

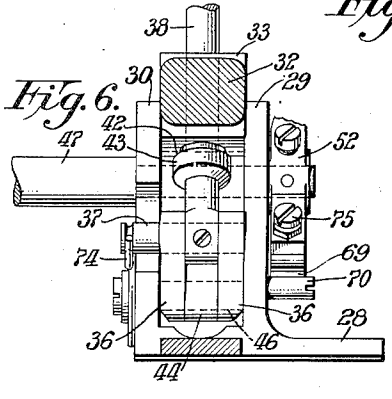


Fig. 6.

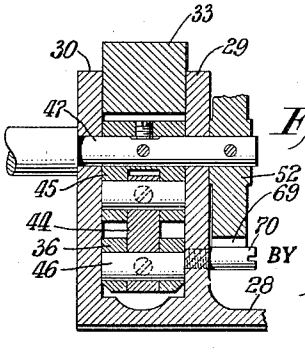


Fig. 7.

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WORK CLAMPING MECHANISM

Filed Nov. 14, 1947 4 Sheets-Sheet 4

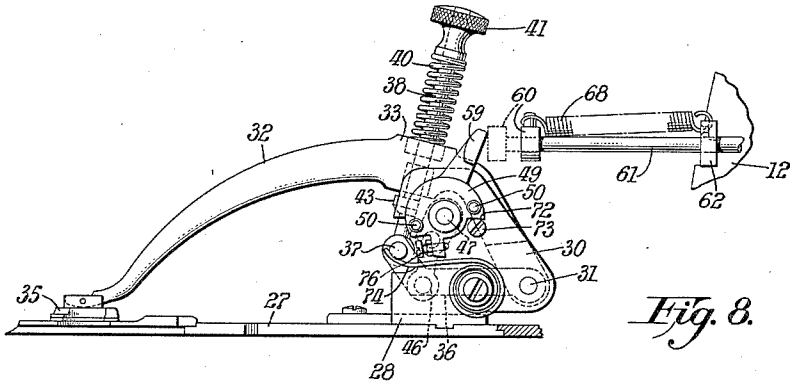


Fig. 8.

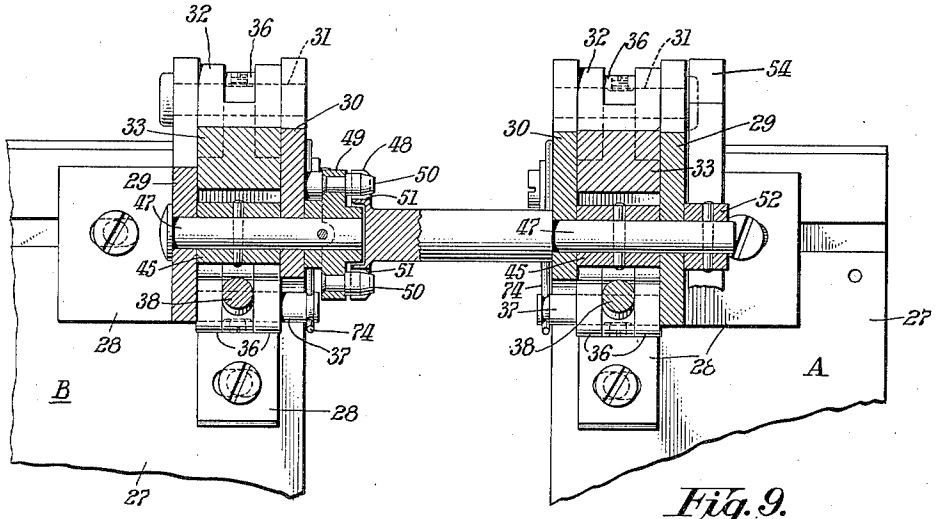


Fig. 9.

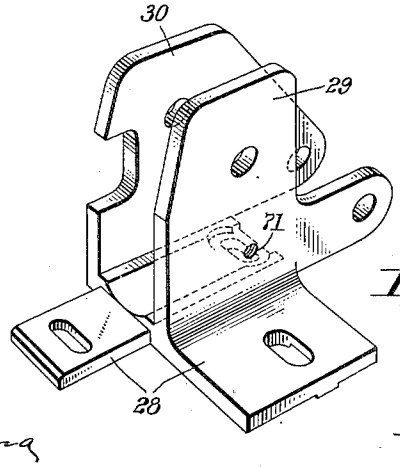


Fig. 10.

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UNITED STATES PATENT OFFICE

2,510,014

WORK-CLAMPING MECHANISM

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Application November 14, 1947, Serial No. 786,014

6 Claims. (Cl. 112—76)

1

This invention relates to sewing machines, more particularly of the type having stitch-forming mechanism and a work-clamp with means for relatively moving them to sew a predetermined group of stitches; the stitch-forming mechanism coming to rest automatically after the predetermined group of stitches has been sewn in the work. Machines of this type are commonly used for eyeletting, buttonholing, tacking and barring operations, etc.

In machines of the type in question, it is common to provide a work-clamp which is adapted to grip the work around the area to receive the desired group of stitches. The work-clamp usually includes a lower clamping plate and an upper clamping foot, which plate and foot are movable to and from each other and, when in work-clamping relation, are normally yieldingly urged toward each other. The upper foot of the work-clamp is preferably divided, longitudinally of the machine-bed, into right and left foot-sections, whereby the two foot-sections are self-adapting to work of different thicknesses under the respective foot-sections. As mentioned above, the upper and lower members of the work-clamp are yieldingly maintained in work-clamping relation and it is with an improved means for maintaining the work-clamping relation between these members that the present invention is particularly concerned.

The primary object of the present invention is to provide a work-clamp which automatically accommodates itself to all classes and thicknesses of work, the work being firmly clamped without requiring any adjustment of the clamp-closing means.

Another object of the present invention is to provide a work-clamp constructed to afford considerable clearance beneath the upper arms of the work-clamp to create sufficient room to place eyelets a reasonable distance back from the edge of the work.

A further object of the invention is to provide a work-clamp which is self-adapting to work of any thickness or texture within wide limits, the effort required to close the work-clamp being small regardless of the thickness of the material.

A still further object of the invention is to provide a work-clamp in which the spring-means for yieldingly maintaining the work-clamp in closed position is utilized to assist in opening the clamp to release the work.

The foregoing and other objects and advantages in view, together with means whereby the same may be carried into effect, will best be understood from the following description of a preferred embodiment of the invention illustrated in the accompanying drawings, in which:

2

Fig. 1 is a right side elevational view, partly in section, of a sewing machine embodying the invention, showing, in full lines, the work-clamp in open position and, in dotted lines, the position of the clamp-closing lever when the work-clamp is closed.

Fig. 2 is a horizontal sectional view taken through the machine-standard showing the work-clamp and its actuating connections in top plan view.

Fig. 3 is a right side elevational view, partly in section, of the work-clamp mechanism showing the clamp-closing lever in a lowered position and just after it has moved the toggle linkage beyond straightened position to secure the work-clamp in its closed or work-clamping position.

Fig. 4 represents an enlarged longitudinal vertical sectional view taken substantially along the line 4—4, Fig. 2, illustrating the position of the toggle-linkage when the work-clamp is open.

Fig. 5 is a view similar to Fig. 4, but showing the position of the toggle-linkage when the work-clamp is closed.

Fig. 6 represents a transverse vertical sectional view taken substantially along the line 6—6, Fig. 5.

Fig. 7 represents a transverse vertical sectional view taken substantially along the line 7—7, Fig. 5.

Fig. 8 is a right hand elevational view of the left hand work-clamp section, showing, in full lines, the clamp-releasing rod in retracted position, and, in dotted lines, the clamp-releasing rod just as it contacts the clamp-releasing lever in its movement to open the work-clamp.

Fig. 9 is an enlarged horizontal sectional view taken substantially along the line 9—9, Fig. 3, showing the separable coupling connecting the alined clamp-closing rock-shafts.

Fig. 10 is an enlarged perspective view of the right hand fulcrum-block to which the arm of the work-clamp is pivoted.

According to the preferred embodiment of the invention illustrated, the sewing machine on which the work-clamp is mounted is constructed with a frame including a bed 11 from which rises a standard 12 of a bracket-arm 13 terminating in a head 14. The usual stitch-forming mechanism of the machine includes a reciprocatory and rotary needle-bar 15 carrying at its lower end a thread-carrying needle 16 with which cooperates the usual underthread mechanism (not

shown). The stitch-forming mechanism is operated in the well known manner by connections with the main-shaft 17 driven by a belt-pulley 18 and controlled, as to its period of operation, by the usual tilting lever 19 of a stop-motion device constructed substantially in accordance with the disclosure in the U. S. patent to E. B. Allen, No. 1,024,490, dated April 30, 1912.

Journaled in the machine-frame are two transverse or cross-shafts 20 and 21, Figs. 1 and 2. Shaft 20 performs a single rotation prior to sewing and carries cam-actuated means which act to close the work-clamp, as will be more fully described later, and to tilt the stop-motion lever 19 into running position. Also operated by shaft 20 is the customary eyelet cutting device (not shown). Shaft 21 performs a single rotation after sewing is completed. It is provided with cam means for opening the work-clamp and for imparting a rapid motion to the feed-wheel to restore the same to its initial starting position and reposition the upper and under stitching devices to their initial sewing positions. These cross-shafts 20 and 21, together with their driving and controlling connections are well known; being constructed substantially in accordance with the disclosure in the U. S. patent of E. B. Allen, No. 1,346,102, issued July 13, 1920. For an understanding of the present invention, it will suffice to say that power is supplied to turn shafts 20 and 21 by a belt through the medium of a pulley 22 journaled on one end of the shaft 20. The pulley 22 is provided with a gear 23 which meshes with a larger gear 24 journaled on the shaft 21. At the proper times in the cycle of operation of the machine the pulley 22 and the gear 24 are clutched to and declutched from their respective shafts 20 and 21 in order that the mechanisms actuated by these shafts may perform their functions in proper sequence.

The work-clamp embodying the present invention preferably comprises separable clamping sections A and B in right and left arrangement, meeting along the center line C. The clamp-sections A, B are each pivotally mounted in the usual way at the front end of the bed 11 and are locked in their normal operative position by means of the spring latches 25 and 26. In design, the clamp-sections A and B are substantially identical, except for the right-hand and left-hand arrangement of their component parts.

Each clamp-section comprises a base or work-supporting plate 27 to the rear end of which is secured, for limited sidewise adjustment, a substantially U-shaped fulcrum-block 28, Fig. 10. The fulcrum-block 28 is provided with upstanding side walls 29 and 30 between which is pivoted, on a stud 31, the bifurcated rear end of an arched foot-supporting or clamp-arm 32 having a body-portion 33 preferably rectangular in cross-section and of sufficient width to engage and slide on the inner faces of the two side walls 29 and 30 of the fulcrum-block 28. The arched arm 32 of clamp-section A carries at its outer or free end a work-clamping foot 34 which is fitted with the usual needle-thread nipping and cutting devices. The arched arm 32 of clamp-section B carries a work-clamping foot 35 which meets with the work-clamping foot 34 along the line C, Fig. 2; the two feet 34, 35 forming a circular work-clamping member within which the stitch-pattern is formed.

The means for closing the work-clamp comprises a bent lever 36, Figs. 4 and 5, having its rear end disposed between the limbs of the bifurcated rear end of the foot-supporting arm 32 and journaled about the axis of the stud 31. At its upwardly bent outer end the lever 36 is pivoted on a pin 37 fixed in the lower end of a substantially vertical pull-rod 38 extending through a clearance hole 39 in the arched arm 32. Surrounding the pull-rod 38 and bearing on the arched arm 32 is a coil-spring 40 of which the upper end thereof reacts against a regulating thumb-nut 41 threaded on the pull-rod 38. The coil-spring 40 normally urges the arched arm 32 against a shoulder 42 of a flange 43 preferably integral with the pull-rod 38. Thus it will be understood that the foot-supporting arm 32 is connected to the bent lever 36 by means of the pull-rod 38, spring 40, thumb-nut 41 and shoulder 42, and that movement of the bent lever 36 about the axis of the stud 31 will raise or lower the work-clamping foot carried by the arm 32.

The means provided for opening and closing the clamp includes a pair of toggle-links 44 and 45 (Figs. 4 and 5); the toggle-link 44 at its lower end being pivoted at 46 to the bent lever 36 and the toggle-link 45 at its upper end preferably being fastened to a rock-shaft 47 journaled in the side walls 29, 30 of the fulcrum-block 28. As will be seen in Fig. 9, the rock-shaft 47 in clamp-section A is in alinement with the rock-shaft 47 in clamp-section B; the two alined shafts being releasably connected together by a coupling comprising two adjacent flanges 48 and 49 of which flange 49 is provided with two diametrically located pins 50 adapted to enter two pin-receiving notches 51 in the flange 48. Fastened on the outer end of the rock-shaft 47 in clamp-section A is a rock-lever 52 having two arms 53 and 54 disposed substantially at right angles to one another. Arm 53 provides a hand-lever by which the work-clamp can be manually closed. Arm 54 is a component of the cam-controlled means which effects an automatic closing of the work-clamp after the cycle of the machine is initiated by the operator. As shown in Figs. 1 and 2, when the work-clamp is open the arm 54 is inclined upwardly and in position to be engaged by the front end of a clamp-closing lever 55 fulcrumed intermediate its ends on a pivot-stud 56 mounted in the standard 12. The rear end of the lever 55 is disposed to be engaged by an actuating cam 57 fast on the cross-shaft 20; a spring 58 being employed adjacent the fulcrum point of the lever 55 to bias the lever in a clockwise direction with its inner end in contact with the cam 57.

Means are provided for automatically opening the work-clamp after the eyelet has been stitched. This means is best shown in Figs. 1, 2 and 8. The rock-shaft 47 of clamp-section B, as previously described, is fitted with the coupling flange 49. This flange 49 is formed with a trip-arm 59 (Fig. 8) which, when the work-clamp is closed, projects upwardly in position to be engaged by the head 60 of an endwise shiftable trip-rod 61 journaled in a guide 62 attached to the machine-standard 12. The trip-rod 61 is connected at its rear end to the upper end of a rock-lever 63 journaled on the fulcrum-axis of the stop-motion lever 19. The rock-lever 63 below its fulcrum has fastened to it by screw 64 a downwardly and forwardly extending arm 65 of which its free end is disposed to be engaged by a cam-lobe 66 fast on a disk 67 mounted on the cross-shaft 21. The trip-rod is normally maintained in retracted position by a coil-spring 68 acting between the head 60 and the guide 62.

Operation

With the work-clamp open as shown in full lines in Fig. 1, the work is properly introduced into the clamp, after which the operator depresses the usual machine-starting lever S (Fig. 2). Through the mechanism associated with the starting lever S, the shaft **20** is clutched to the continuously rotating driving pulley **22**, whereby it is caused to make one complete revolution. During this revolution of the shaft **20**, the cam **57** carried thereby is effective to lower the front end of the clamp-closing lever **55** from the full line position shown in Fig. 1 to the position shown in Fig. 3. During this movement of the lever **55**, the rock-lever **52**, which is engaged by the inner end of the lever **55**, is actuated and effects a turning of the rock-shaft **47** in each of the clamp-sections A and B. Turning of the rock-shaft **47** results in a movement of the toggle-links **44** and **45** from a buckled into a straightened position and through the straightening of toggle-links the bent lever **36** is pivoted on its stud **31** and exerts a downward pull on the rod **38**. The pull of the rod **38** is transmitted to the foot-supporting arms **32** through the coil-springs **40**. The foot-supporting arms **32** follow the downward movement of the bent lever **36** until the work-clamping feet **34** and **35** carried by the arms **32** engage the work, after which additional movement of the bent lever **36** acts to move the pull-rod **38** relative to the arm **32** and compress the springs **40**. To lock the work-clamp closed, the toggle-links **44** and **45** are moved to a point slightly beyond their straightened or alined position, as shown in Fig. 5. The work-clamp locking position of the toggle-links **44** and **45** in clamp-section A is determined by a stop-shoulder **69** (Fig. 3) on the rock-lever **52** contacting a stop-screw **70** threaded into a hole **71** provided in the wall **29** of the fulcrum-block **28**, while on clamp-section B the locking position of the toggle-links is determined by a stop-shoulder **72** (Fig. 3) on the coupling-flange **49** engaging a stop-pin **73** threaded into the wall **30** of the fulcrum-block **28**.

It will be appreciated that the work-clamp will readily accommodate thick as well as thin material without requiring any adjustment, the only change being that when thick material is placed into the work-clamp there is slightly more movement of the pull-rod **38** relative to the foot-supporting arm **32**. This additional movement of the pull-rod **38** compresses the spring **40** a little more, but not to a degree effecting any material change in the clamping pressure on the work. Thus it will be understood that the toggle-links **44** and **45** travel through their full movement regardless of the thickness of the material in the work-clamp and that any variation in the thickness of the work is compensated for by the movement of the pull-rod **38** relative to the foot-supporting arm **32**.

After the stitching operation is completed, the cross-shaft **21** is automatically clutched to its driving gear **24** and given one complete revolution in the direction of the arrow in Fig. 1 in order that a rapid return motion may be imparted to the feed-wheel to restore the same to its initial starting position and to return the upper and under stitching devices to their initial sewing positions. During this single revolution, the cam-lobe **66** on the disk **67** carried on the cross-shaft **21** engages the arm **65** of the rock-lever **63** and pivots said lever in a direction to shift the trip-rod **61** toward the trip-arm **59** (Fig. 8). The trip-rod **61**, moving in opposition to the spring **68**, contacts the trip-arm **59** and turns it in a counterclockwise direction (Fig. 8), causing the rock-shaft **47** in each of the clamp-sections A and B to turn and move the toggle-links **44** and **45** from clamp-locking position shown in Fig. 5 to a buckled position shown in Fig. 4. After the toggle-links **44** and **45** move beyond straightened position the foot-supporting arm **32** of each clamp-section is biased into an elevated position by means of a spring-wire **74** (Fig. 8) which bears upwardly on the extended end of the pin **37**. The elevated position of the foot-supporting arm **32** of clamp-section A is determined by the limit screw **75** (Fig. 1) on the rock-lever **52**, which limit screw is adapted to engage the stop-pin **70**. The elevated position of the foot-supporting arm of clamp-section B is determined by the limit screw **76** (Fig. 8) which is adapted to engage the stop-pin **73**.

From the foregoing, it will be understood that I have invented a work-clamp having considerable clearance beneath the foot-supporting arms thereof, with the mechanism for lowering and raising said arms being located back from the work-clamping feet permitting the stitching pattern to be applied to the body of the garment a considerable distance in from the edge of the garment. Also, the construction of the clamp-sections is such that either thin or thick materials may be firmly clamped with a substantially uniform pressure without requiring any change in adjustment. Moreover, the clamp-sections may be closed on thick or thin material with the application of only a small amount of effort.

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

1. A work-clamp for a sewing machine, comprising, a lower clamp-member, a clamp-arm pivotally supported on said lower clamp-member, a clamp-foot carried by said clamp-arm, clamp-closing and -opening means for effecting relative movement between said clamp-member and said clamp-foot, said means including a pair of toggle-links and a toggle-actuated connection fulcrumed on the pivotal support of said clamp-arm and yieldingly associated with said clamp-arm, and means for actuating said clamp-closing and -opening means.

2. A sewing machine work-clamp comprising, a lower work-supporting plate, a clamp-arm fulcrumed on said plate and having a clearance opening therethrough, an upper clamp-foot carried by said clamp-arm, a rock-shaft, a pair of toggle-links connected at one end to said rock-shaft, a pivotally mounted lever operatively connected to the other end of said toggle-links, a rod connected to said pivotally mounted lever and extending through said clearance opening in said clamp-arm, a spring between said rod and said clamp-arm through which pressure is applied to the clamp, and means for actuating the rock-shaft.

3. A sewing machine work-clamp comprising, a lower work-supporting plate, an arched upper clamp-arm fulcrumed at one end on said plate, a clamp-foot carried by the other end of said clamp-arm, a rock-shaft disposed beneath said clamp-arm and adjacent the fulcrum-axis of said clamp-arm, a pair of toggle-links connected at their upper end to said rock-shaft, a pivotally supported lever connected to the lower end of said toggle-links, a pull-rod connected to said pivotally supported lever, a spring interposed between said rod

and said clamp-arm through which pressure is applied to the clamp, and means for actuating said rock-shaft.

4. A sewing machine work-clamping mechanism, comprising, a clamp-arm pivotally mounted for movement about a fulcrum-axis, a work-clamping foot carried by said clamp-arm, a lever pivotally mounted upon said fulcrum-axis, a yielding connection between said lever and clamp-arm, and means including toggle-links connected to said lever for swinging said clamp-arm about its fulcrum-axis.

5. A sewing machine work-clamping mechanism, comprising, a clamp-arm pivotally mounted for movement about a fulcrum-axis, a work-clamping foot carried by said clamp-arm, a movable lever, a member connected to said lever, a spring interposed between said member and said clamp-arm, a pair of clamp-closing toggle-links operatively connected to said lever and effective to close said work-clamp when moved into straightened position, and mechanism for actuating said toggle-links.

6. A sewing machine work-clamping mechanism, comprising, a clamp-arm pivotally mounted for movement about a fulcrum-axis, a work-clamping foot carried by said clamp-arm, a lever pivotally mounted on said fulcrum-axis, clamp-closing toggle-links connected for swinging said lever about its fulcrum, a member connecting said lever to said clamp-arm, and a spring disposed in the connections between said toggle-links and said clamp-arm for yieldingly holding said work-clamping foot in work-engaging position when said toggle-links are in straightened position.

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