April 30, 1940. H. F. GRUMAN 2,199,173

WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Original Filed April 12, 1937 6 Sheets-Sheet 1

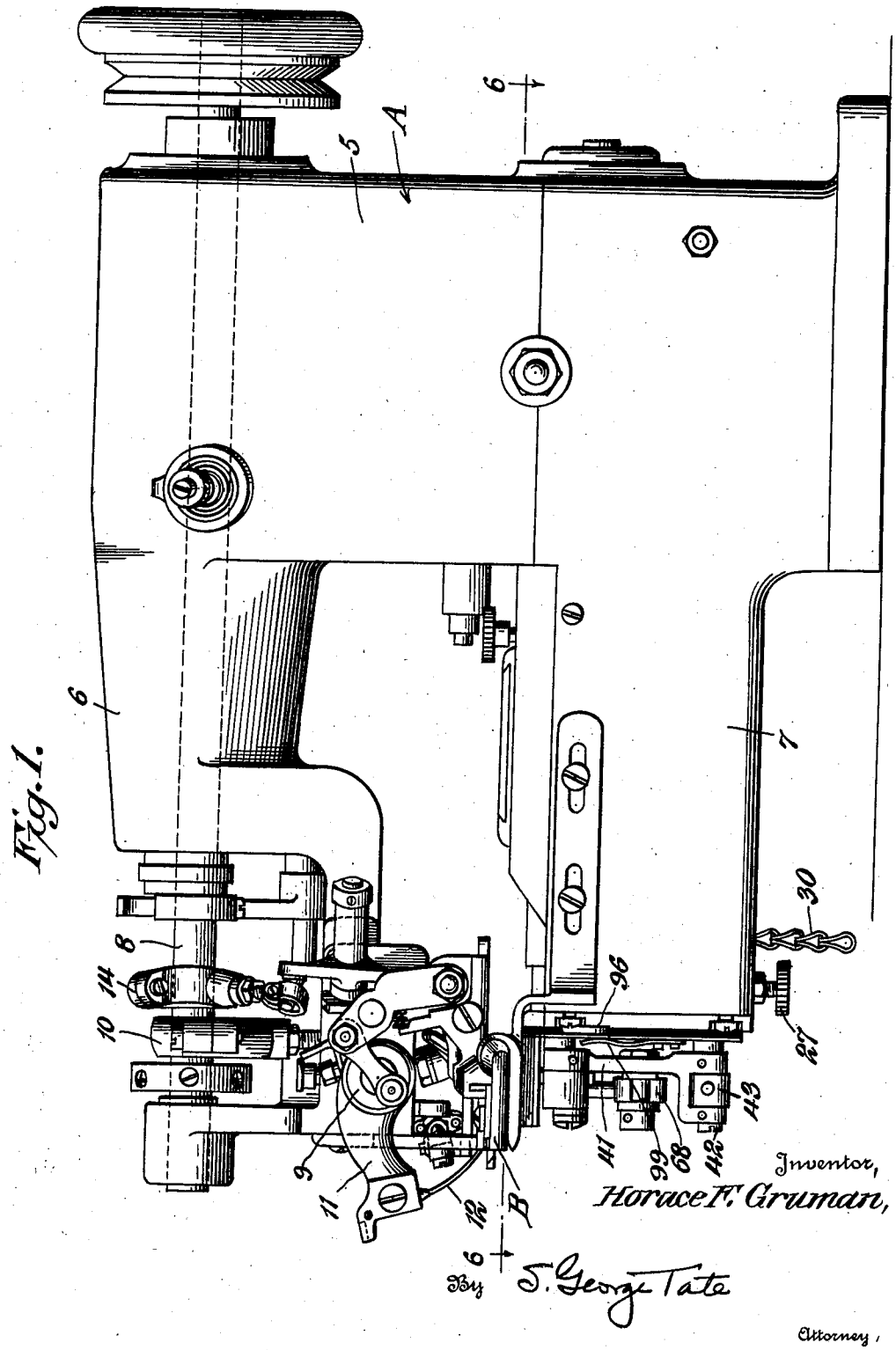


Fig. 1.

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WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Original Filed April 12, 1937 6 Sheets-Sheet 2

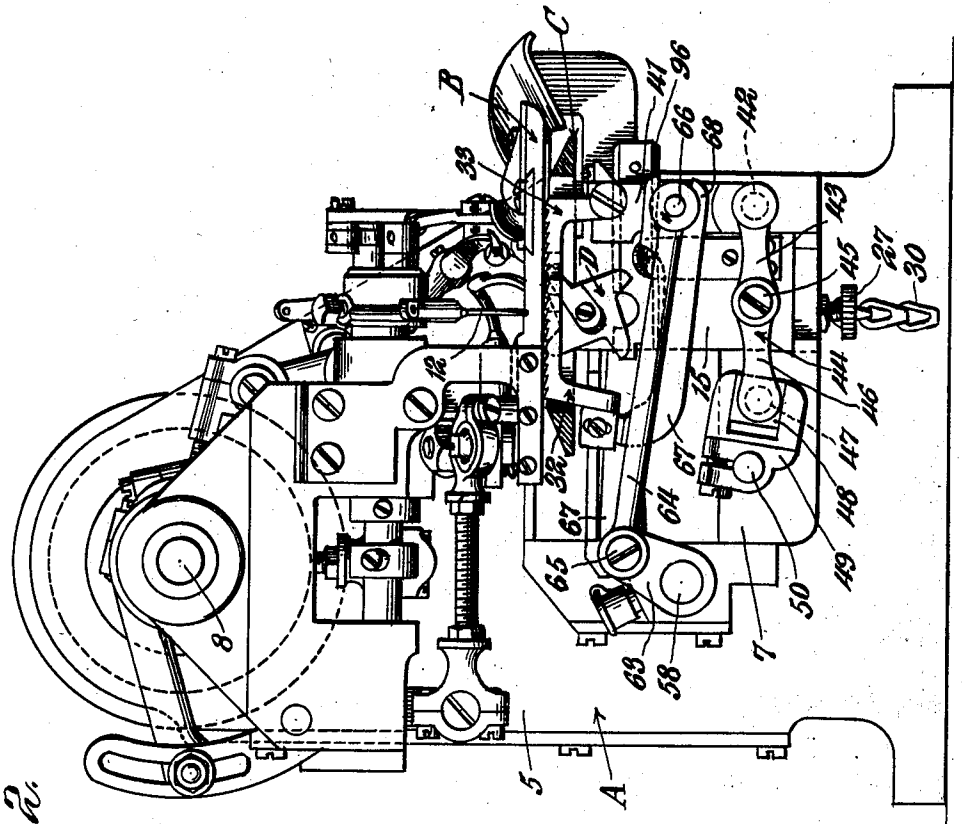


Fig. 2.

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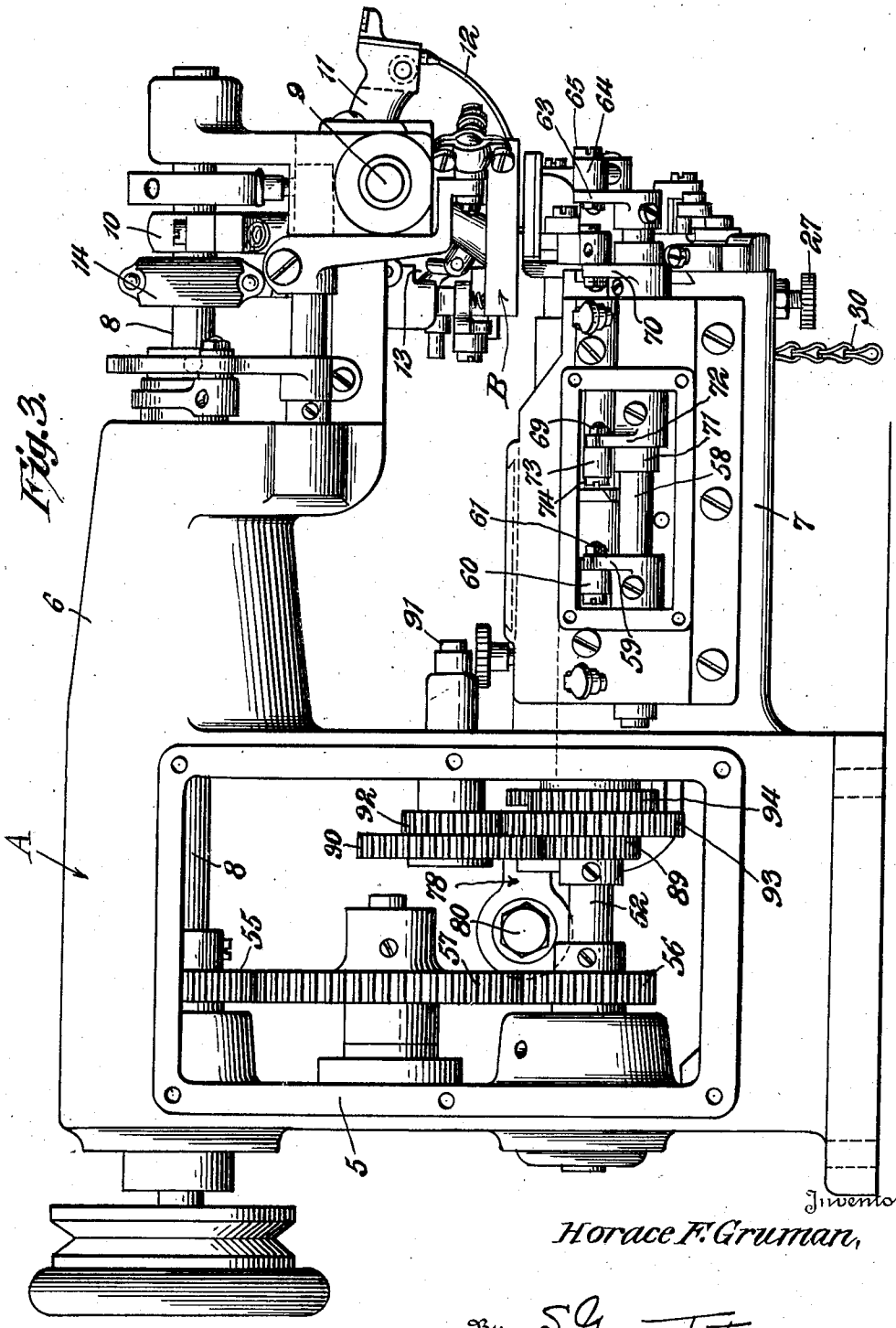
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WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Original Filed April 12, 1937 6 Sheets-Sheet 3

Fig. 3.



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WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

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Fig. 9.

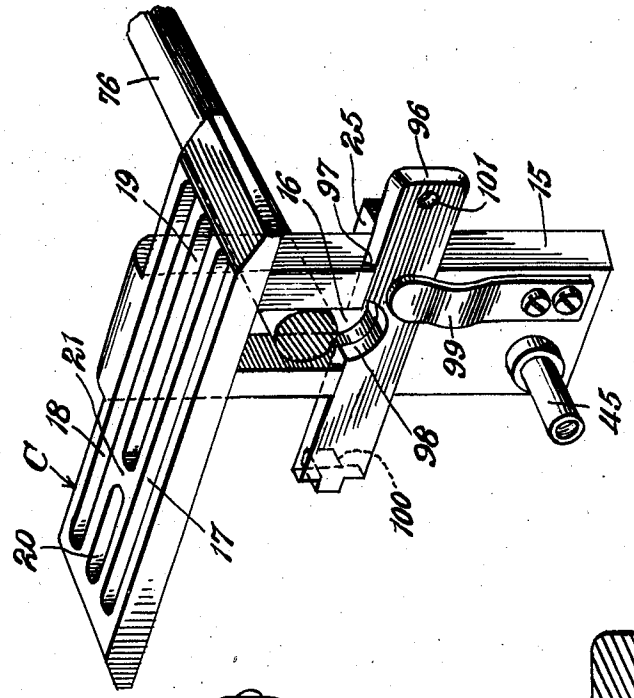
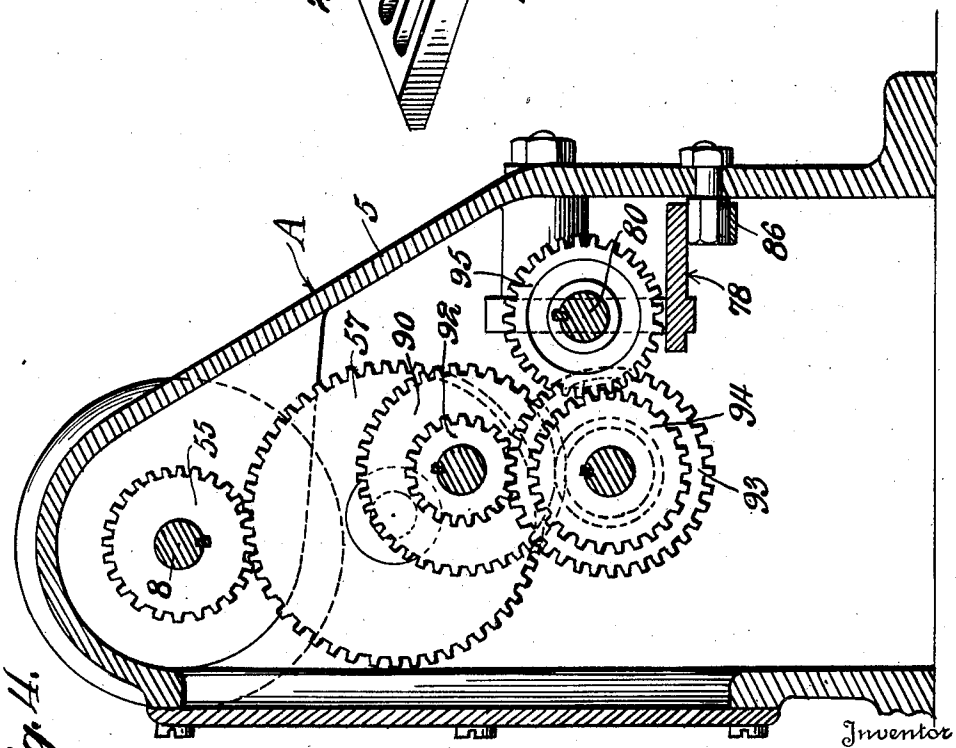


Fig. 14.



Inventor

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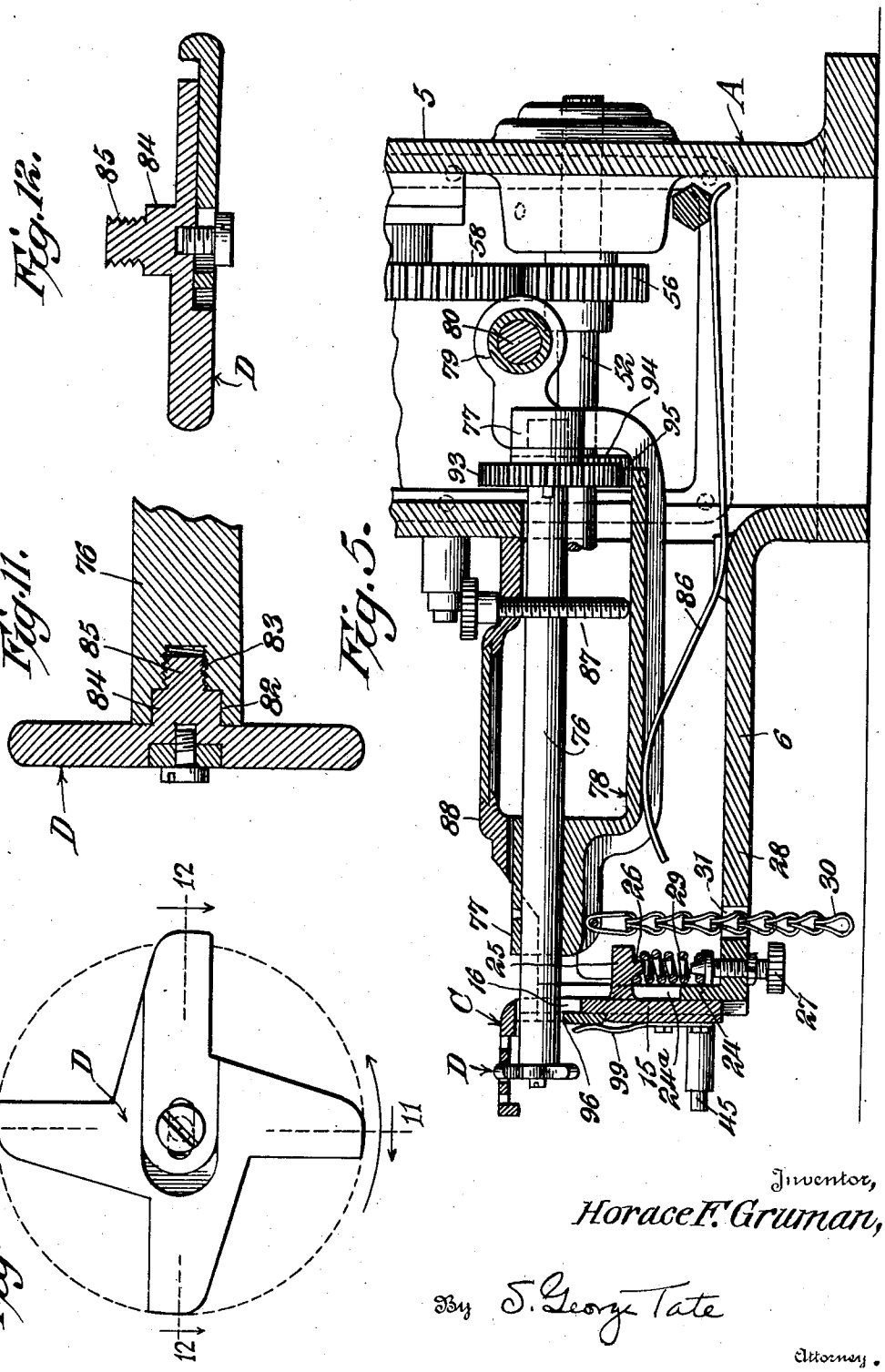
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WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Original Filed April 12, 1937 6 Sheets-Sheet 5



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WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Original Filed April 12, 1937 6 Sheets-Sheet 6

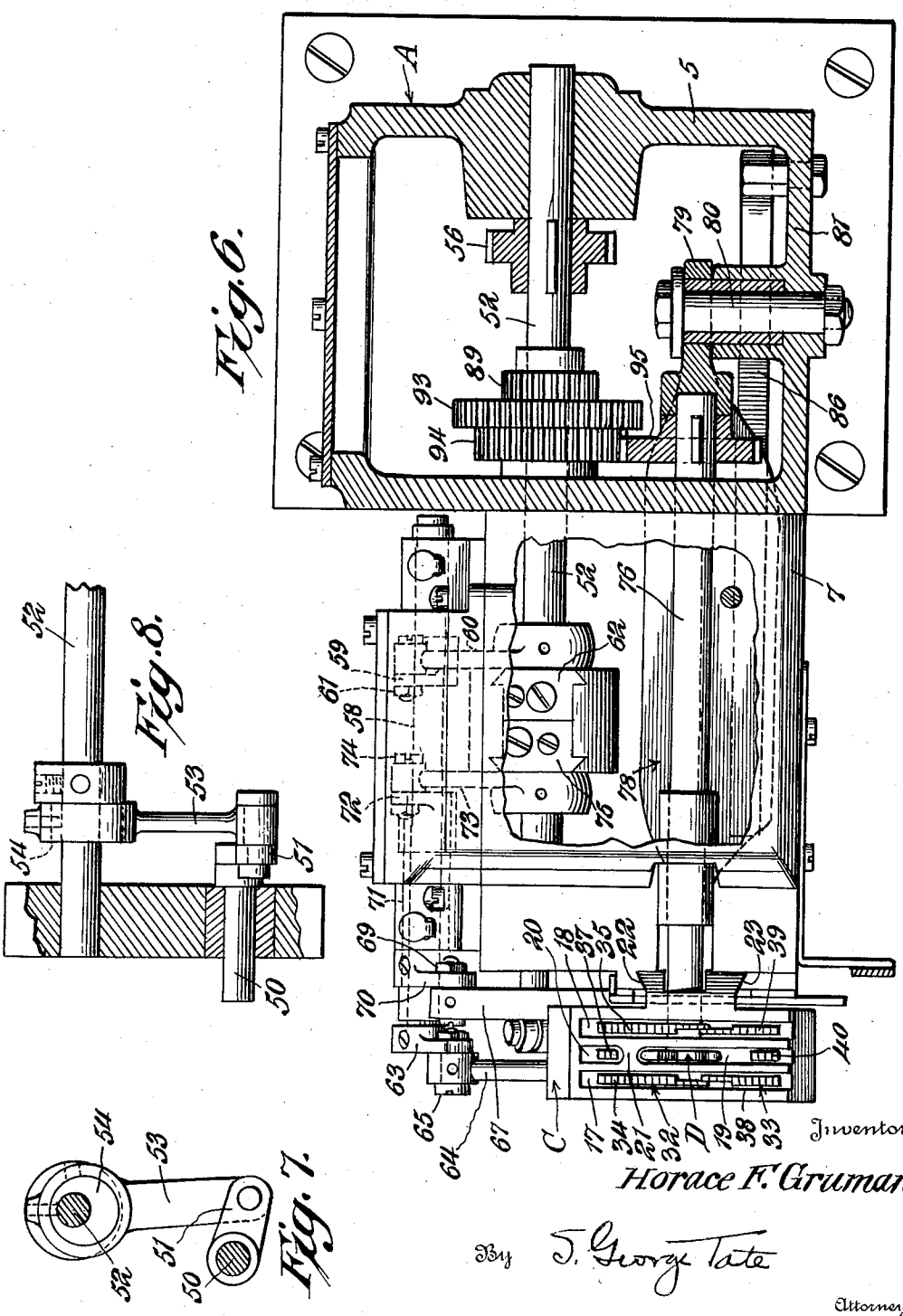


Fig. 6.

Fig. 8.

Fig. 7.

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UNITED STATES PATENT OFFICE

2,199,173

WORK SUPPORT FOR BLIND STITCH SEWING MACHINES

Horace F. Gruman, St. Louis, Mo., assignor to Geoffrey Stevenson, Buffalo, N. Y.

Original application April 12, 1937, Serial No. 136,466. Divided and this application October 25, 1937, Serial No. 170,917

24 Claims. (Cl. 112—260)

This invention relates to new and useful improvements in sewing machines generally, although more particularly to the work support of a blind stitch sewing machine.

This application constitutes a division of my parent application Serial No. 136,466, filed April 12, 1937, for improvements in Sewing machines.

The principal object of this invention is to provide means for depressing as a unit the work clamp or support, the ridge forming element, and the feed dogs whereby the work may be readily inserted or withdrawn from the machine.

With the above and other objects in view which will more fully appear, the nature of the invention will be more clearly understood by following the description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a front elevation of a sewing machine constructed in accordance with my invention,

Figure 2 is a left end elevation thereof,

Figure 3 is a rear elevation of the machine,

Figure 4 is a vertical section taken through the frame standard,

Figure 5 is a vertical longitudinal section taken through the lower frame arm,

Figure 6 is a horizontal section taken on the line 6—6 of Figure 1,

Figures 7 and 8 are detail views showing the driving connection for the feed lift rock shaft,

Figure 9 is an enlarged perspective view of the work clamp,

Figure 10 is an enlarged side elevation of the ridge forming disc,

Figure 11 is a vertical section taken on the line 11—11 of Figure 10, and

Figure 12 is a horizontal section taken on the line 12—12 of Figure 10.

Like reference numerals designate corresponding parts throughout the several figures of the drawings.

The sewing machine which embodies my invention includes a main frame A having a hollow standard 5 and upper and lower hollow arms 6 and 7 which extend laterally from the left side of the standard. A main shaft 8 extends longitudinally along the upper arm 6 and across the standard 5. A horizontal presser foot B having an opening, is rigidly attached to the free end of the upper arm 6. An oscillatory horizontal needle shaft 9 extends at right angles to the main shaft 8 and is journaled in the upper arm 6 above the presser foot B, said needle shaft being driven from the main shaft by connections indicated generally at 10. A needle arm 11 is fixed to the shaft 9 and attached to said arm is a needle 12 which reciprocates across the presser foot opening. A looper 13 which cooperates with the needle to form connected blind stitches, is driven from the main shaft 8 by connections indicated generally at 14.

Cooperating with the under face of the presser foot B to clamp the fabric against the thrust of the needle, is a horizontal work clamp or support C which is rigidly secured along its right hand edge to the upper end of a vertical shank or post 15 having a vertical slot 16 formed therein. The work clamp is provided with three parallel and longitudinally extending feed slots of equal length, there being two side slots 17, 18 and an interrupted intermediate slot comprising a front portion 19, a rear portion 20, and an intermediate "chaining-off" bridge 21. The intermediate slot is centered with respect to the opening in the foot, and the side slots 17, 18 are located on opposite sides of said opening. These slots extend from a point in front of the needle path to a point well in rear thereof. The work clamp is supported on the lower frame arm 7 for vertical movements with respect to the presser foot, and to this end the shank 15 is supported for slidable movements between vertical guides 22, 23, the guide 22 being a part of the end wall 24 of said lower frame arm 7, and the guide 23 being removably mounted on said wall. The end wall 24 between said guides is provided with a vertical slot 24a and fixed to the shank and projecting through the slot into the interior of the frame arm, is an abutment or arm 25 having a depending pilot stud 26. An adjusting screw 27 is threaded upwardly into the bottom wall 28 of the frame arm 7 directly below the stud 26, and a coil spring 29 is interposed between the stud and the screw for yieldably urging the work clamp upwardly and for normally retaining said clamp in yieldable engagement with the presser foot. In order to depress the work clamp C against the tension of the spring 29, I have provided a treadle or knee-press operated chain 30 which extends upwardly through an opening 31 in the bottom wall 28 of the frame 7 and is connected indirectly at its upper end to the work clamp, as will be explained hereinafter.

Cooperating with the under face of the presser foot B to feed the fabric rearwardly are a 4-motion main feed dog 32 and a 4-motion differential feed dog 33. The main feed dog 32 includes two long side sections 34, 35 and a short

intermediate section 37 which operate in the rear portion of the feed slots of the work clamp. The side sections are disposed on opposite sides of the presser foot opening and extend forwardly to a point slightly in front of the needle path, but the intermediate section is disposed wholly in rear of the needle path and in rear of said opening. The differential feed dog includes two long side sections 38, 39 and a short intermediate section 40 which operate in the front portions of the feed slots in the work clamp. The side sections 34, 38 and 35, 39 of the feed dogs are arranged in overlapping relation for engaging the body fabric throughout the combined length of both dogs.

The differential feed dog 33 is attached to the upper end of a vertically disposed differential feed bar 41 which is fulcrumed at its lower end as at 42 to the front arm 43 of a horizontal feed lift lever 44 which is fulcrumed as at 45 on the shank 15 of the vertically movable work clamp C. Pivotally mounted on the rear arm 46 of the lever as at 47 is a slide block 48 which is slidably mounted in a forked rock arm 49. The arm 49 is fixed to and extends from a feed lift rock shaft 50 which is journaled in the rear portion of the lower frame arm 7. The shaft 50 is provided with a rock arm 51 located within the frame arm 7 and this arm is oscillated from a horizontal countershaft 52, which extends lengthwise of the arm and across the standard, by a pitman 53 which is pivotally connected at its lower end to the rock arm and has its upper end engageable with a driving eccentric 54 fixed to said countershaft as shown in Figs. 7 and 8. The shaft 52 is driven from the main shaft 8 by a 1–to–1 gear coupling located within the standard 5 and comprises a driving gear 55 fixed to the main shaft, a driven gear 56 fixed to the driven countershaft 52, and an intermediate gear or idler 57 journaled on the standard. Although I have specifically shown and described a gear coupling between the main shaft 8 and the countershaft 52, any other known mechanical driving means having a 1–to–1 ratio may be employed and I therefore use the term "gear coupling" in its broadest sense. Thus during each rotation of the main shaft the differential feed dog will be raised and lowered. Journaled in the lower frame arm 7 in rear of the rock shaft 50 is a differential feed travel rock shaft 58 which is actuated from the driven shaft 52 by means of a rock arm 59 located within the lower frame arm 7 and fixed to the shaft 58, and a pitman 60 which is pivotally connected as at 61 to said rock arm and has operative connection with the driven shaft through the medium of an adjustable eccentric fixed to said driven shaft and indicated as an entirety by the numeral 62. Fixed to the left hand end of the rock shaft 58 is a rock arm 63 and a horizontal link 64 is pivotally connected at its rear end as at 65 to said rock arm and is pivotally connected at its front end to a stud or pin 66 fixed to the differential feed bar 41. Consequently a back and forth movement will be imparted to the differential feed dog 33 during each rotation of the main shaft, and by adjusting the eccentric 62 the feed stroke of the dog may be varied.

The main feed dog 32 is attached to a forwardly and slightly downwardly inclined main feed bar 67. The front end of the bar is provided with a fork 68 which has sliding engagement with the pin 66 fixed to the differential feed bar 41 and consequently the front end of the main feed bar is supported by and moves upwardly and downwardly with said differential feed bar. The rear end of the main feed bar 67 is pivotally connected as at 69 to a rock arm 70 fixed to a sleeve or tubular feed travel shaft 71 which surrounds the differential feed travel shaft 58. A rock arm 72 is fixed to the tubular shaft 71 and this arm is oscillated from the driven countershaft 52 by a pitman 73 which is pivotally connected as at 74 with said rock arm and has operative connection with the driven shaft through the medium of an adjustable eccentric fixed to said driven shaft and indicated as an entirety by the numeral 75. Consequently a back and forth movement will be imparted to the main feed dog during each rotation of the main shaft, and by adjusting the eccentric 75 the feed stroke of the dog may be varied.

From the foregoing, it will be seen that both feed dogs are moved upwardly and downwardly in unison, and that the feed travels of the dogs are independently adjustable.

In the operation of the feeding mechanism, let it be assumed that the differential feed bar 41 is beginning its upward stroke. The lever 44 is rocked about its fulcrum 45 and the feed bar is lifted until it engages the under face of the presser foot. The lever 44 then shifts its fulcrum to the pin 42 and consequently the original fulcrum 45 is moved downwardly taking the work clamp C therewith. This frees the fabric from its clamped condition between the foot and the work clamp, and permits the feed dogs to function. At the end of the feed stroke, the original fulcrum is moved upwardly while the auxiliary feed bar is moved downwardly, whereby the work clamp will be restored to its initial clamping position.

Projecting upwardly through the front intermediate opening 19 of the work clamp and into the opening of the presser foot is a ridge forming element D for presenting a ridge of fabric to the needle. When hemming operations are being performed the ridge will include the body fabric and the inner edge portion of the hem.

Located within the lower frame arm 7 is a rotary shaft 76 whose longitudinal axis lies in the vertical plane containing the needle path of movement. This shaft is journaled in spaced right and left bearings 77, 77 of a lever arm 78 which is provided at its inner end with a transverse horizontal bearing 79 journaled on a stud 80 fixed to the front wall 81 of the frame arm 7. The outer or left end portion of the shaft projects through the slot 24a of the end wall 24 of the lower frame arm 7 and through the vertical slot 16 of the shank 15 of the work support C, and is provided at its outer end with an inwardly extending counterbore 82 and a threaded bore 83. The ridge forming element D, as shown in Figs. 10, 11 and 12, is in the nature of a star disc, and this disc is provided with an integral hub 84 which is received by the counterbore 82 and the hub is provided with an integral threaded pin or reduced extension 85 which is threadably engaged in the bore 83 whereby the disc may be readily removed. The disc shaft 76 is pressed upwardly by a spring 86 located intermediate the supporting lever arm 78 and the bottom wall 28 of the lower frame arm 7, and a manually operable screw 87 which is threaded downwardly into the top wall 88 of the lower frame arm 7 engages said lever arm and thereby enables the operator to vary the effective height of the disc relative to the needle path, the spring also functioning to permit the disc to be automatically lowered when seams or thicker fabrics are fed

through the machine. The disc shaft 76 is continuously rotated from the countershaft 52 by a driving connection which in the present instance includes a reduction gear coupling having a 4-to-1 ratio. Although, I have specifically shown and described a gear coupling between these shafts, any other known mechanical reduction driving means may be employed and I therefore use the term "reduction gear coupling" in its broadest sense. To this end, a relatively small gear 89 which is fixed to the countershaft 52 within the frame standard 5, drives a relatively large gear 90 which is loose on a stub shaft 91 fixed to the standard, the ratio being 2-to-1. Fixed to the gear 90 is a gear 92 of the same diameter as the gear 89, and this gear 92 drives a gear 93 which is loose on the countershaft 52, the ratio of the gears 92, 93 being 1-to-2. Fixed to the gear 93 is a gear 94 and fixed to the disc shaft 76 adjacent the transverse pivot 88 thereof is a gear 95 which is in constant mesh with the driven gear 94, the ratio of the gears 94, 95 being 1-to-1, and consequently the disc will be rotated once during every four revolutions of the main shaft. The teeth of the gears 94, 95 are so constructed as to permit the upward and downward swinging of the disc shaft 86 without any binding.

The upper end of the chain 30 previously described is connected to the free end of the lever arm 78 which supports the disc shaft 76. An interponent or bar 96 is mounted in a horizontal groove 97 formed in the shank 15 of the work clamp C for sliding movements across the vertical opening 16 of said shank, the interponent being formed along its upper edge with a recess 98. The interponent is retained in its groove or seat 97 by a flat spring 99 attached to the shank 15, and the forward movement of the interponent is limited by a stop 100 carried thereby and engaging the rear edge of the shank. An opening 101 is formed in the forward end of the interponent for facilitating the forward movement thereof. The disc shaft 76 projects through the slot 16 above the interponent. When the interponent is in its forward position the recess 98 will not register with the slot 16 and consequently the disc shaft when depressed by the chain 30 will engage said interponent and thereby depress the work clamp together with the feed so as to permit the ready insertion of fabric in the machine, or removal therefrom. When, however, it is desirable to remove the ridge forming element D from the shaft 76 for the purpose of substituting another element, it is necessary to provide means for lowering the element below the presser foot and the work clamp in order for the element to clear the latter, and for this purpose the interponent 96 is moved rearwardly until the recess 98 therein registers with the opening 16 of the shank 15 of the work clamp. The operator can then depress the shaft 76 into the recess 98 and thereby position the disc D entirely below the work support whereby the disc may be readily removed from the shaft and another disc substituted thereon.

It will, therefore, be seen that the shaft 76 is substantially horizontal at all times; that by having the fulcrum 79, 80 located within the frame standard 5 the shaft 76 will form a long radius for the ridge forming element D and consequently the element will move in a substantially vertical plane when it is depressed by reason of cross seams passing thereover and the ridge of fabric will not become distorted by said movement; that the upper portion of said element normally projects upwardly through the opening 19 of the work clamp C and into the presser foot opening, and consequently when it is desired to remove the element from the shaft it is necessary to swing the shaft downwardly until the element clears the work clamp; that when the interponent 96 is in its rearmost position, the shaft may be swung downwardly by a pull on the chain 30 without depressing the work clamp and the feed, and that when the interponent is in its foremost position the work clamp, the feed, and the element will be depressed by a pull on the chain to thereby permit the ready insertion of work into the machine or the removal of work therefrom.

It is of course to be understood that the details of structure and arrangement of parts may be variously changed and modified without departing from the spirit and scope of my invention.

I claim:

1. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and formed in a single rigid length, means independent of said work clamp for supporting the shaft for movement about its axis and for swinging movement about a transverse axis, and means for swinging the shaft to depress the ridge forming element and for simultaneously effecting a depression of the work clamp.

2. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, spring means for yieldably retaining the work clamp against depression, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and formed in a single rigid length, means independent of said work clamp for supporting the shaft for movement about its axis and for swinging movement about a transverse axis, a stop for limiting the upward swinging movement of the shaft, spring means for yieldably retaining the shaft against depression, and means for swinging the shaft to depress the ridge forming element and for simultaneously effecting a depression of the work clamp.

3. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and formed in a single rigid length, means independent of said work clamp swingable about a transverse axis and constituting the sole means for supporting the shaft for rotary movement, means for rotating said shaft, and means for effecting a simultaneous depression of the work clamp and a swinging of the shaft to depress the ridge forming element without disconnecting said shaft rotating means.

4. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element formed in a single rigid length and fulcrumed to swing about a transverse axis, means for continuously rotating said shaft including a driven gear fixed thereto,

and means for swinging the shaft to depress the ridge forming element without disconnecting said shaft rotating means and for simultaneously depressing the work clamp.

5. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a horizontal lever arm fulcrumed to swing about a transverse axis, a shaft extending longitudinally of said arm and journaled therein, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, and means connected to said arm for swinging the shaft downwardly to depress the ridge forming element and for simultaneously depressing the work clamp.

6. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and fulcrumed to swing about a transverse axis, means movable between effective and ineffective positions forming an abutment between the shaft and the work clamp, and means for swinging the shaft to depress the ridge forming element and for simultaneously depressing the work clamp.

7. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a horizontal lever arm fulcrumed to swing about a transverse axis, a shaft extending longitudinally of said arm and journaled therein, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, means forming an abutment between the shaft and the work clamp, and means connected to said arm for swinging the shaft downwardly to depress the ridge forming element and for simultaneously depressing the work clamp.

8. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a work clamp located below the foot and supported on the free end of the lower arm for vertical movements, a horizontal shaft extending longitudinally within the lower arm and pivoted therein to swing about a transverse axis, the outer end of the shaft projecting under the work clamp, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, and means for swinging the shaft to depress the ridge forming element and for simultaneously depressing the work clamp.

9. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a work clamp located below the foot and supported on the free end of the lower arm for vertical movements, spring means for yieldably retaining the work clamp against depression, a horizontal shaft extending longitudinally within the lower arm and pivoted therein to swing about a transverse axis, the outer end of the shaft projecting under the work clamp, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, a stop mounted on the lower arm for limiting the upward swinging movement of the shaft, spring means for yieldably retaining the shaft against depression, and means for swinging the shaft to depress the ridge forming element and for simultaneously depressing the work clamp.

10. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a work clamp located below the foot and supported on the free end of the lower arm for vertical movements, a horizontal shaft extending longitudinally within the lower arm and pivoted therein to swing about a transverse axis, the outer end of the shaft projecting under the work clamp, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, means forming an abutment between the shaft and the work clamp, and means operatively connected with the shaft for swinging the latter to depress the ridge forming element and for simultaneously depressing the work clamp.

11. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a work clamp located below the foot and having a depending vertical shank supported on the free end of the lower arm for vertical sliding movements, said shank having an opening therein, a shaft extending longitudinally within the lower arm and pivoted therein to swing about a transverse axis, the outer end of the shaft projecting through the opening in said shank and having abutment with the latter, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, and means for swinging the shaft to depress the ridge forming element and for simultaneously depressing the work clamp.

12. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft removably supporting said element and fulcrumed to swing about a transverse axis, and means for either swinging the shaft downwardly to depress the ridge forming element and for simultaneously depressing the clamp or for swinging the shaft downwardly without depressing the clamp for facilitating the removal of said ridge forming element.

13. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft removably supporting said element and fulcrumed to swing about a transverse axis, and means including an interponent between the clamp and the shaft for swinging the shaft to depress the ridge forming element and for simultaneously depressing the clamp, said interponent being movable to a position to effect the downward swinging of the shaft without depressing the clamp for facilitating the removal of said ridge forming element.

14. In a sewing machine, the combination of a stationary presser foot, an independently movable work clamp opposed to said foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and fulcrumed to swing

about a transverse axis, and means for effecting a swinging of said shaft and a depression of said element with or independently of said work clamp.

15. In a sewing machine, the combination of a stationary presser foot, an independently movable work clamp opposed to said foot, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and fulcrumed to swing about a transverse axis, a stop for limiting the upward swinging movement of the shaft, independent spring means for yieldably retaining the shaft and the work clamp against depression, and means for effecting a swinging of said shaft and a depression of said element with or independently of said work clamp.

16. In a sewing machine, the combination with a stationary presser foot, of a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft rigid throughout its length supporting said element and fulcrumed to swing about a transverse axis, means including intermeshing gears for rotating said shaft, one of said gears being mounted directly on said shaft, and means for swinging said shaft to depress said element without disconnecting said shaft rotating means.

17. In a sewing machine, the combination with a stationary presser foot, of a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal lever arm fulcrumed to swing about a transverse axis, a shaft rigid throughout its length extending longitudinally of said arm and having its sole support therein, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, a stop cooperating with the arm to limit the upward swinging movement of the shaft, spring means cooperating with the arm for yieldably retaining the shaft against depression, means connected to the arm for swinging the shaft downwardly to depress the ridge forming element, and shaft driving means including a driven element mounted on and swingable with the shaft.

18. In a sewing machine, the combination with a stationary presser foot, of a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal lever arm fulcrumed to swing about a transverse axis, a shaft rigid throughout its length extending longitudinally of said arm and journaled therein, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, means for continuously rotating said shaft including a driven gear fixed to the shaft, a stop cooperating with the arm to limit the upward swinging movement of the shaft, spring means cooperating with the arm for yieldably retaining the shaft against depression, and means connected to the arm for swinging the shaft downwardly to depress the ridge forming element without disconnectng said shaft rotating means.

19. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a horizontal shaft rigid throughout its length extending longitudinally within the lower arm and supported to swing about a transverse axis located within the standard, the outer end of the shaft being located under the presser foot, a ridge forming element attached to the outer end of the shaft for projecing a ridge of fabric upwardly through the foot, spring means cooperating with the shaft for yieldably urging the ridge forming element upwardly, a vertically adjustable stop for limiting the upward swinging movement of the shaft and a gear couple for rotating said shaft including a gear fixed to said shaft.

20. In a sewing machine, the combination with a frame including a standard having upper and lower arms extending laterally therefrom, of a horizontal presser foot fixed to the free end of the upper arm, a horizontal shaft rigid throughout its length extending longitudinally within the lower arm and supported to swing about a transverse axis located within the standard, the outer end of the shaft being located under the presser foot, a ridge forming element attached to the outer end of the shaft for projecting a ridge of fabric upwardly through the foot, spring means cooperating with the shaft for yieldably urging the ridge forming element upwardly, a vertically adjustable stop for limiting the upward swinging movement of the shaft, and means for continuously rotating said shaft including a driven gear fixed to the shaft adjacent the fulcrum thereof.

21. In a sewing machine, the combination with a stationary horizontal presser foot having an opening, of a work clamp located below the foot and having an opening, a horizontal shaft fulcrumed to swing about a transverse axis and having one end disposed below the work clamp, a ridge forming element removably connected to said end of the shaft and normally having its upper portion projecting upwardly through the opening in the clamp and into the presser foot opening, and means for swinging the shaft downwardly to depress the ridge forming element to a position wholly below the clamp whereby said element may be removed.

22. In a sewing machine, the combination with a stationary horizontal presser foot having an opening, of a work clamp located below the foot and having an opening, a horizontal shaft fulcrumed to swing about a transverse axis and having one end disposed below the work clamp, a ridge forming element removably connected to said end of the shaft and normally having its upper portion projecting upwardly through the opening in the clamp and into the presser foot opening, spring means cooperating with the shaft for yieldably urging the ridge forming element upwardly, a vertically adjustable stop for limiting the upward swinging movement of the shaft, and means for swinging the shaft downwardly to depress the ridge forming element to a position wholly below the clamp whereby said element may be removed.

23. In a sewing machine, the combination with a stationary horizontal presser foot having an opening, of a work clamp located below the foot and having an opening, a horizontal shaft fulcrumed to swing about a transverse axis and having one end disposed below the work clamp, a ridge forming element removably connected to said end of the shaft and normally having its upper portion projecting upwardly through the opening in the clamp and into the presser foot opening, said element comprising a disc having angularly spaced peripheral portions arranged in tandem, the disc being provided with a concentric hub terminating in a reduced threaded projection, the end of the shaft being formed with a counterbore for receiving said hub and with a threaded bore for receiving said extension, and

means for swinging the shaft downwardly to depress the ridge forming element to a position wholly below the clamp whereby said element may be removed.

24. In a sewing machine, the combination with a stationary horizontal presser foot, of a vertically movable work clamp located below the foot, a 4-motion feed dog supported on the work clamp, a ridge forming element for projecting a ridge of fabric upwardly through the foot, a horizontal shaft supporting said element and fulcrumed to swing about a transverse axis, and means for swinging the shaft to depress the ridge forming element and for simultaneously depressing the work clamp and the feed dog.

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