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2,849,972

BUTTON HOLE ATTACHMENT FOR SEWING MACHINE

Filed Jan. 31, 1956

3 Sheets-Sheet 1

FIG. 1

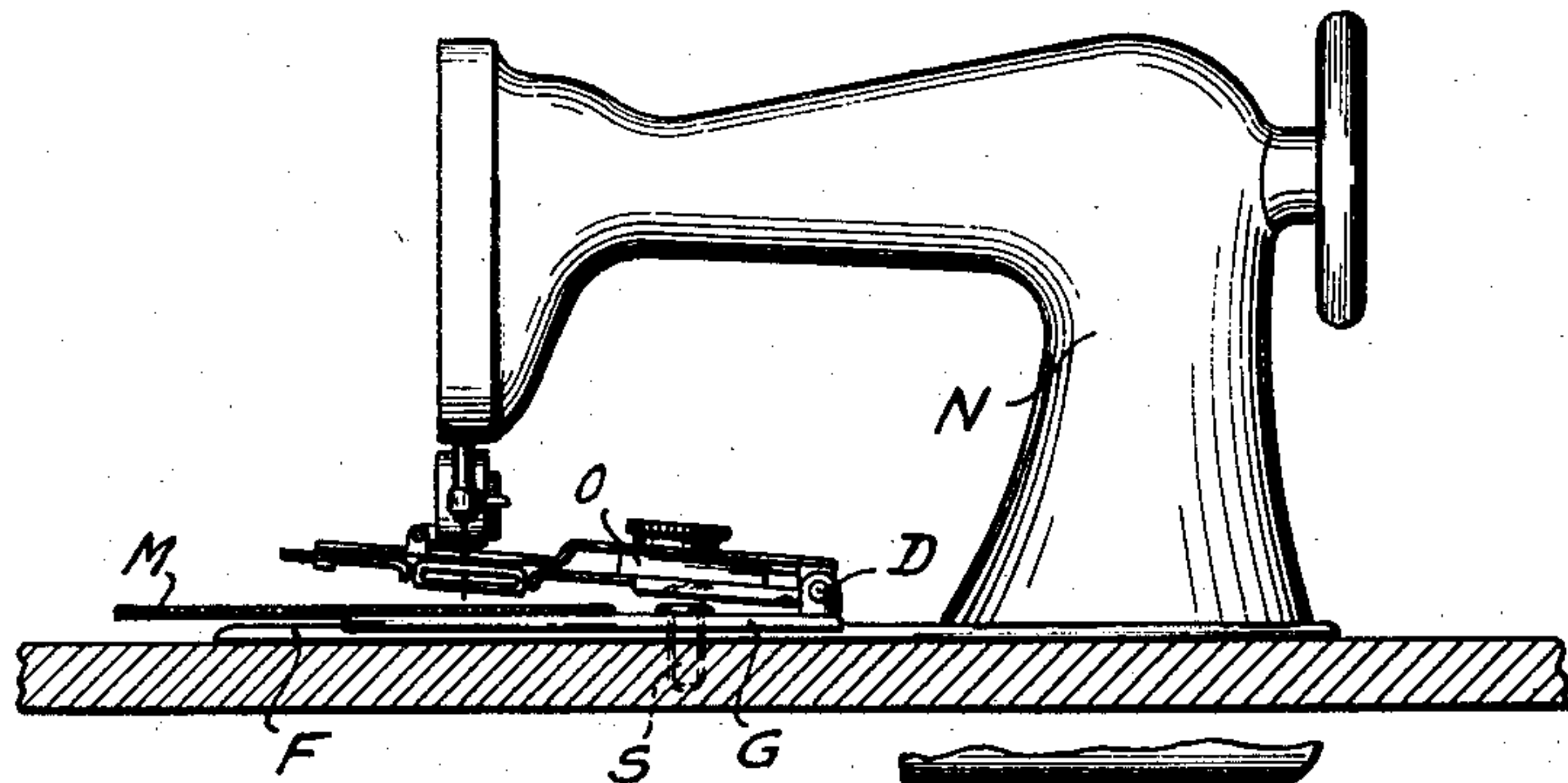


FIG. 3

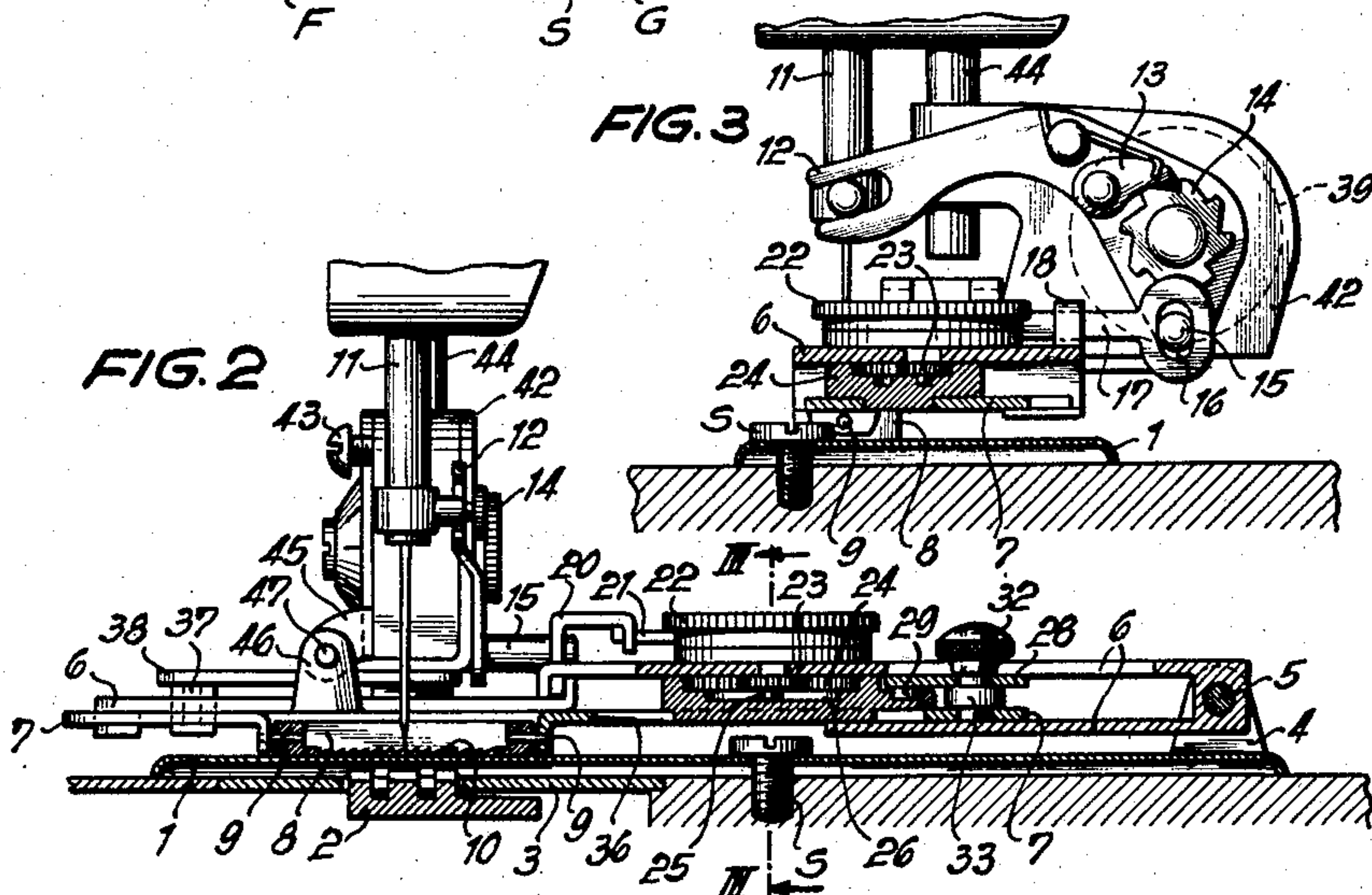
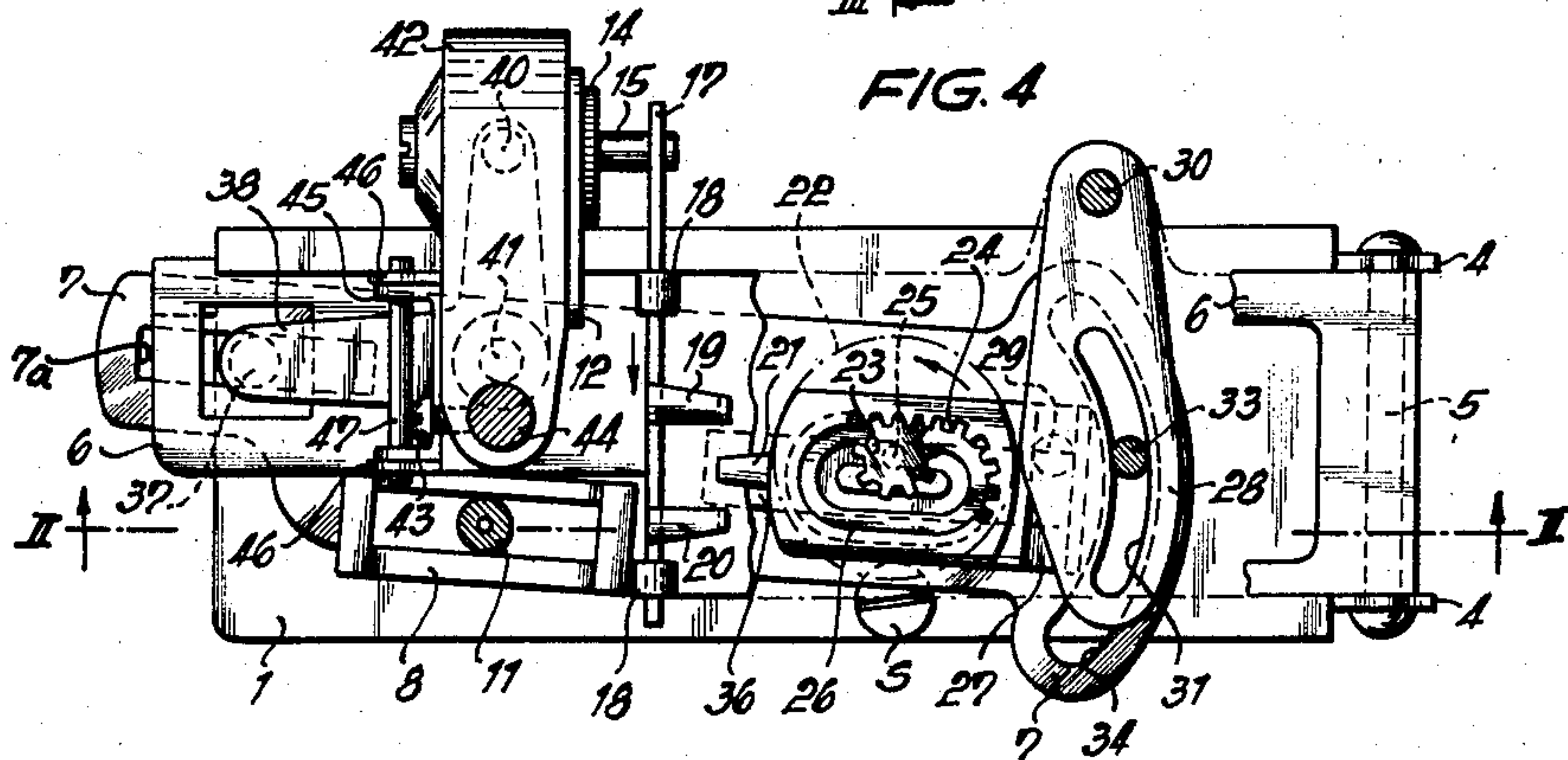


FIG. 4



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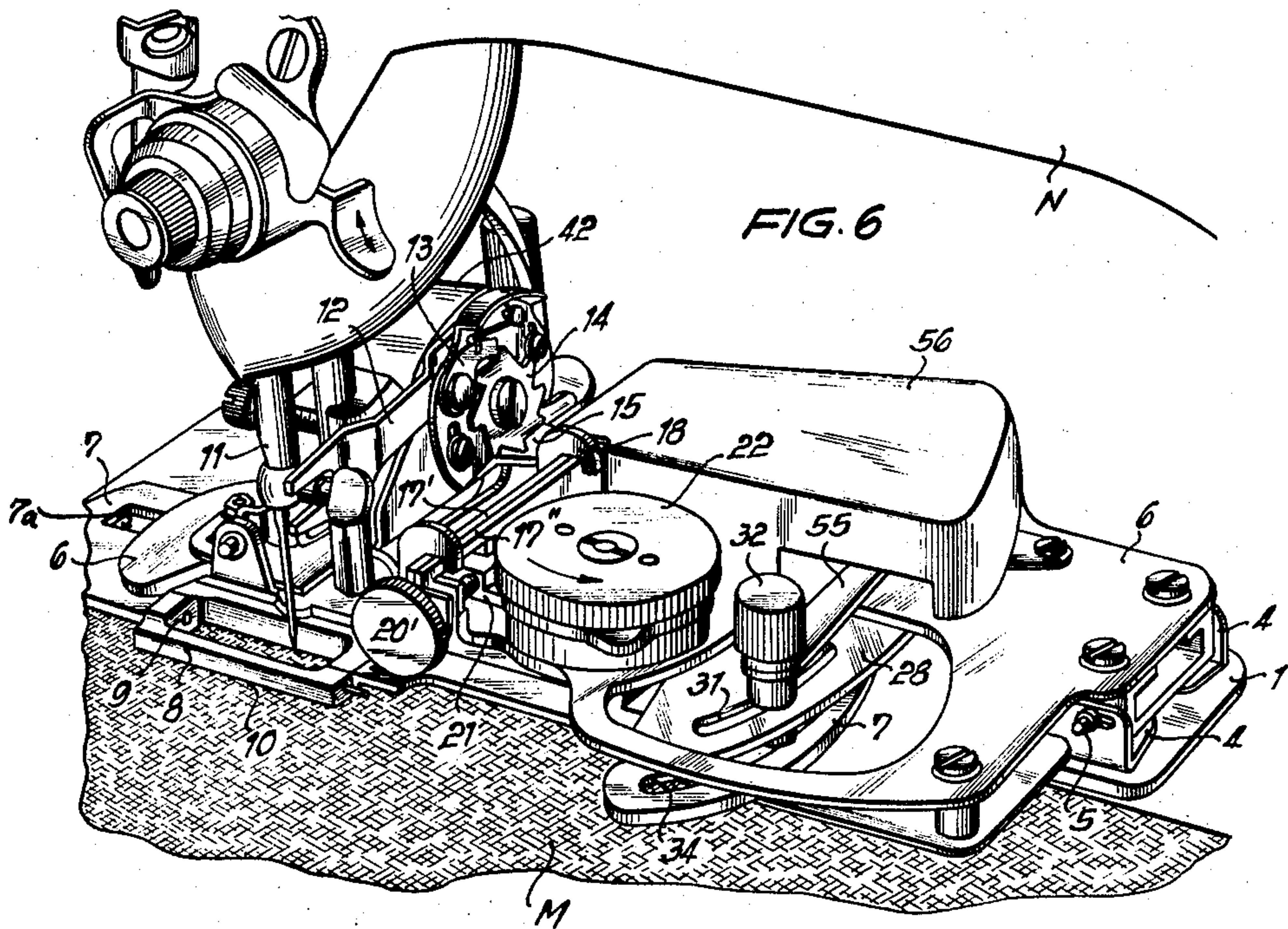
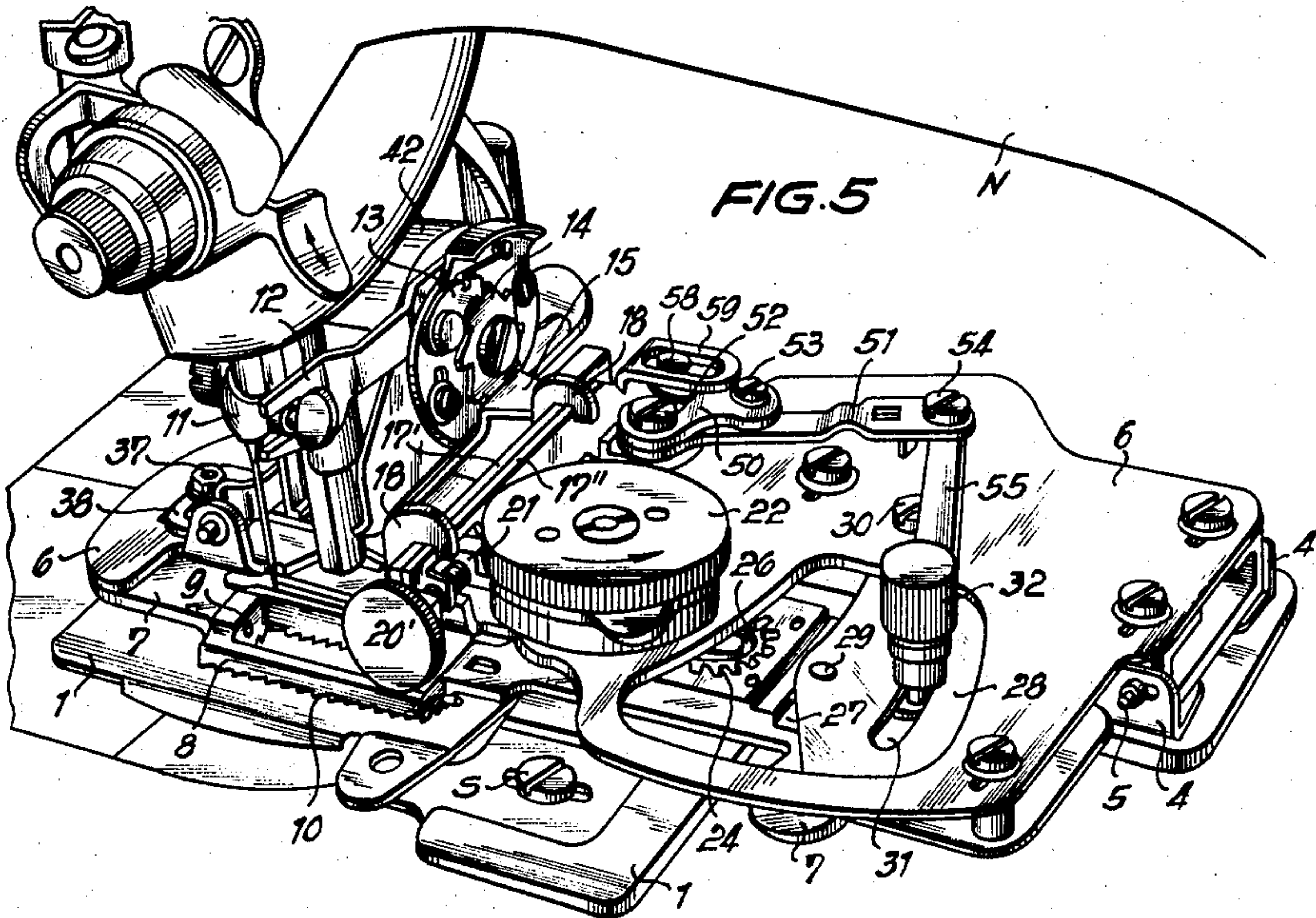
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BUTTON HOLE ATTACHMENT FOR SEWING MACHINE

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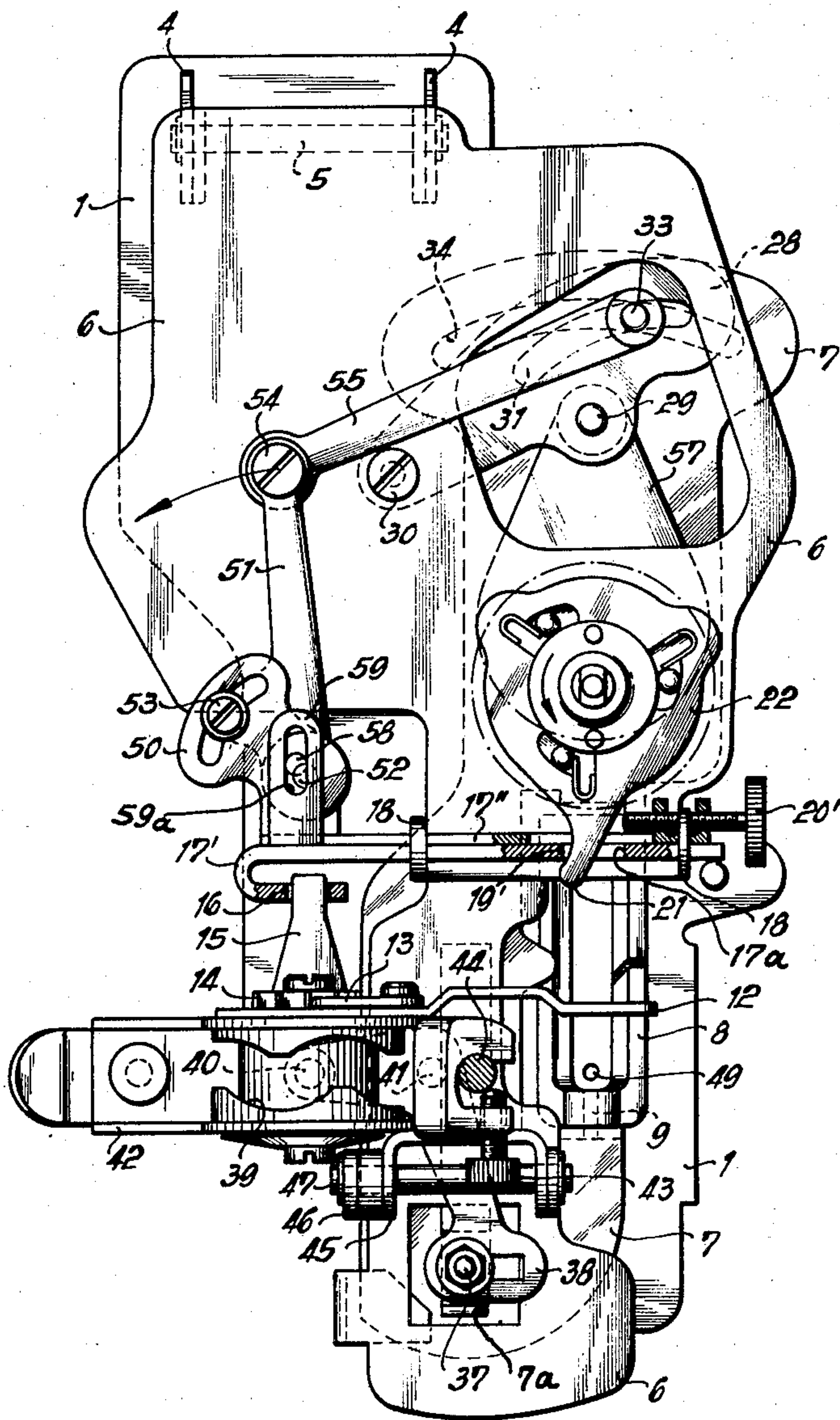
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BUTTON HOLE ATTACHMENT FOR SEWING MACHINE

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FIG. 7



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BUTTON HOLE ATTACHMENT FOR SEWING MACHINE

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3 Claims. (Cl. 112-77)

This invention relates to button hole attachments for use in connection with sewing machines.

It is an object of the present invention to provide means facilitating sewing of button holes in clothing, fabrics and like materials in such a manner that the spacing between the stitches around each button hole remains substantially constant regardless of the size of the button hole.

It is another object of the present invention to provide means enabling button holes of different lengths to be sewed with one and the same sewing machine employing an attachment provided with a single endless rack arranged in cooperative relation with an adjustable lever transmission system for moving the material in which the button holes are formed along a predetermined path relative to the needle of the machine.

Still another object of the present invention is the provision of means contributing to a compact and highly efficient attachment for sewing machines to be used for sewing button holes, which attachment may be easily mounted on standard sewing machines and operatively connected with both the presser bar and the needle bar thereof to ensure accurate sewing of said button holes.

Yet another object of the present invention is to provide means affording a substantially simplified and greatly improved button hole attachment for use with sewing machines, a mechanism being included in said attachment capable of automatically adjusting the spacing between the button hole stitches in accordance with the length of the corresponding button hole.

More particularly, the invention relates to a button hole attachment for use with sewing machines, which attachment consists of a plate-like lower part affixed to the base or sole plate of the sewing machine, as by means of screws, and of an upper part connected to the lower part by means of a suitable horizontal hinge or joint. The upper part is, thus, arranged for swinging movement about the horizontal axis of the hinge and is so connected with the presser bar of the sewing machine that it may be raised and lowered together with said presser bar.

The upper part of the attachment supports a longitudinally and transversely movable material displacement lever which imparts to the material to be provided with button holes the longitudinal and transverse movements required during the sewing of the button hole stitches. The actuating means for this displacement lever is constituted by the upwardly and downwardly moving needle bar of the sewing machine, whereby the longitudinal displacements of said lever can be effected by means of a uniformly toothed endless rack or the like.

The constant motion of the actuating means is transmitted to the displacement lever by means of a suitable lever system, the transmission ratio of which can be adjusted through changing the length of one of the lever arms, so that button holes of different lengths can be sewed.

In accordance with the invention a free-wheel drive is provided, and an adjustable dog or catch is so coupled to the transmission lever system which serves to adjust the length of the button hole that said dog or catch is automatically adjusted to a position in which it regulates the working stroke of the free-wheel drive and thus the

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displacement, relative to the sewing needle, of the material in which the button hole is to be sewed, in such a manner as to produce buttonholes of any desired length, with stitches of approximately equal spacing irrespective of the length of the buttonhole.

In particular, this may be attained by providing two slide members, each having a dog or catch engageable with a driving or actuating lever member of the free-wheel drive. The slides may be positively coupled with each other for purposes of codirectional displacement, but are also longitudinally displaceable relative to each other, whereby the interval or spacing between the respective dogs or catches may be varied.

These and other objects and advantages of the invention will become further apparent from the following detailed description, reference being made to the accompanying drawings showing preferred embodiments of the invention.

In the drawings:

Fig. 1 is a schematic illustration of a sewing machine having an attachment constructed in accordance with the present invention mounted thereon;

Fig. 2 is a partial sectional view of one form of such an attachment, the view being taken in the direction of sight of a person using the sewing machine and substantially along the line II-II in Fig. 4;

Fig. 3 is a partial sectional view taken along line III-III in Fig. 2;

Fig. 4 is a horizontal plan view of the attachment as mounted on a sewing machine, some of the upper portion of the machine not being shown;

Fig. 5 is a diagrammatic view in perspective of another form of attachment mounted on a sewing machine;

Fig. 6 is a diagrammatic view of the attachment shown in Fig. 5 and illustrates further a cover for the slide actuating mechanism, as well as the relation of the material being sewed to the attachment; and

Fig. 7 is a schematic horizontal plan view of the attachment shown in Figs. 5 and 6.

Referring now to Fig. 1, the attachment according to the invention consists, in essence, of two parts, a lower part G which functions as a base plate and is fixedly attached to the base or sole plate F of a sewing machine N by means of a screw S, and a substantially plate-like upper part O which is linked to the presser bar 44 (Fig. 3) of the sewing machine. The lower plate G and the upper part O are pivotally connected by means of a horizontal hinge or like joint D.

When the presser bar of the sewing machine is raised, the upper part O is swung upwardly in a vertical plane about the horizontal axis of the hinge D, so that the material M being sewed is freed. When the presser bar is lowered, the material is pressed against the lower plate G by the normally downwardly spring-biased presser bar.

As may be seen more particularly from Figs. 2 to 4, the lower plate G consists of a plate member 1 substantially U-shaped in cross-section, the plate member 1 being disposed above and covering the material feed element 2 and the stitch plate 3 of the sewing machine, whereby the latter two elements may remain on the sewing machine and need not be removed therefrom during sewing of button holes. At the rear end of the plate 1 (the right hand end in Figs. 2 and 4) are provided two vertical lugs 4, between which extends a hinge pin 5, the upper part O of the attachment being pivotally supported by the hinge pin 5.

The upper part O of the attachment consists of a bearing or carrier plate 6 beneath which the material displacement or shifting lever 7 is guided for longitudinal and transverse displacement. The bearing plate 6 carries at its front end (the left hand end in Figs. 2 and 4) a material displacement foot 8. The latter is swingably

supported by means of lateral pivot pins 9 and is provided on its lower surface with teeth or serrations 10 for gripping the material being sewed.

The material displacement lever 7 has imparted thereto, for the formation of the outline of a button hole, both a transverse movement and a continuous longitudinal movement. To this end, a control lever 12 is positively coupled to the needle bar 11 of the sewing machine. The control lever actuates a ratchet-pawl control mechanism which consists of a pawl 13 disposed on the lever 12 and of a rotatably supported ratchet wheel 14. A control pin 15 extends laterally from the lever 12 and engages in a slot 16 of a slide member 17.

As will be readily seen from Fig. 3, the slide member 17 is linearly reciprocated through upward and downward swinging movement of the lever 12. The slide member 17 is supported in a pair of bearings 18 arranged on the bearing plate 6, and is provided with two dogs or extensions 19 and 20 spaced from each other longitudinally of the slide member. The dog 20 is adjustably supported on the slide member 17, whereby the spacing between the extensions 19 and 20 may be varied to adjust the stitch width, as described more particularly hereinafter.

The slide 17 drives, by means of the dogs 19 and 20, a control or actuating lever 21 of a free-wheel gear 22, for example, a friction gear, which is disposed at a fixed location on the bearing plate 6 and arranged to rotate with its shaft in only one direction, as by suitable clutch means. When the slide 17 is moved in the direction of the arrow shown in Fig. 4, then the free-wheel gear 22 is rotated in counter-clockwise direction and drives a pinion 23 mounted on said shaft. Upon return movement of the slide 17, the free-wheel gear 22 rotates idly in a clockwise direction and permits the pinion 23 to remain stationary.

The stepwise movement so imparted to the pinion 23 is transmitted to an endless rack 24, the teeth of which mesh with the teeth of the pinion 23. In order that the rack 24 should not be displaced laterally with respect to and disengaged from the pinion 23, a pin or stud 25 provided at the lower end of the pinion shaft rides in a groove 26 provided on the upper surface of the rack supporting member.

The motion of the rack 24, which is due to the fact that the location of the pinion 23 on the plate 6 is fixed, as is the case with the gear 22, is transmitted to an adjustment lever 28 by means of a pin 29 riding in a groove 27 extending transversely to the longitudinal axis of the rack. The adjustment lever 28 is swingably mounted on a rotatable pin or bolt 30 and is provided with an arcuate slot 31.

An adjustment bolt 33 engages in the slot 31 and may be clamped to the adjustment lever by means of a nut 32. The adjustment bolt 33 simultaneously engages loosely in an arcuate slot 34 of the material displacement or shifting lever 7, so that the latter is in this manner positively coupled with the adjustment lever 28.

The motion of the endless rack 24 is thus transmitted through the pin 29 to the adjustment lever 28 which pivots about the bolt 30, and from the lever 28 through the adjustment bolt 33 to the displacement lever 7. The arcuate length of the path of movement of the adjustment bolt is, therefore, greater or smaller depending on the distance between the adjustment bolt 33 and the rotational or pivot axis, i. e., the pivot bolt 30, of the adjustment lever 28.

Since the adjustment bolt 33 is coupled with the displacement lever 7, the longitudinal displacement of the latter is made larger or smaller in accordance with the adjusted position of the bolt 33. In this manner, it is possible to sew a number of button holes of different lengths while using the same endless rack.

During its longitudinal movements engendered by corresponding movements of the rack 24, the material dis-

placement lever is guided through a tang or extension 37 attached to the free end of a bell-crank lever 38 and engaging in a longitudinal slot 7a in the material displacement lever. When the endless rack has moved sufficiently to bring one of its end or reversal points into mesh with the pinion 23 so as to be shifted laterally of or transversely to its longitudinal axis, the displacement lever 7, is pivoted or swung about the tang 37, whereby the adjustment bolt 33 is displaced in the arcuate slot 34 of the displacement lever. Through the swinging or pivoting of the latter, the material M gripped by the foot 8 will also be correspondingly displaced.

The bell-crank lever 38 imparts to the displacement lever 7 at the same time a zig-zag motion. To this end, the bell-crank lever is pivotally supported on a pin or bolt 41 and is driven by means of a pin 40 which engages a control cam 39. The cam 39 is unidirectionally rotated in stepwise fashion by means of the ratchet and pawl mechanism 13—14 driven by the control lever 12. The cam 39 is supported in a housing 42 which is fixedly attached, by means of a screw 43, to the presser bar 44 of the sewing machine.

Upon raising of the presser bar 44, as indicated above, the bearing plate 6 is swung upwardly about the hinge pin 5. However, since the housing 42 is fixedly connected with the presser bar 44, there is arranged a further hinge between the housing 42 and the bearing plate 6. This last mentioned hinge consists of a U-shaped bracket 45 fixedly attached to the housing 42 and of two lugs 46 extending upwardly from the bearing plate 6, through which lugs a hinge pin 47 extends.

The operation of the attachment will be apparent from the foregoing description, and it will be readily realized that the stitch width, i. e., the spacing between adjacent stitches, will vary inversely with the separation of the dogs 19 and 20.

Thus, as may be seen from Fig. 4, when the dogs are spaced relatively far apart, the stitches made by the needle of the sewing machine will be closer to one another than when the dogs are positioned relatively near each other.

Turning now to the improved form of attachment illustrated in Figs. 5 to 7, in which those elements corresponding to the elements in Figs. 1 to 4 bear the same reference numerals, actuation of the free-wheel gear is effected by means of two parallelly arranged slides 17' and 17'' (in lieu of the single slide 17 of Figs. 2 to 4) which are supported jointly in the bearings 18. The slide 17' is positively coupled at its rear end (the left hand end in Fig. 7) with the pin or extension 15 of the control lever 12.

The slide 17' is provided, intermediate its ends, with a slot or opening 17a through which the control or actuating lever 21 of the free-wheel gear 22 extends. The rear edge 19' of the slot 17a corresponds to the dog 19 shown in Fig. 4. The slide 17'' carries an adjustment screw 20' which corresponds to the other dog 20 shown in Fig. 4.

Thus it will be seen that through adjustment of the screw 20' relative to the slide 17', i. e., relative to the edge 19' of the slot 17a, any desired stitch-width may be provided for button holes of all sort regardless of their lengths. This adjustment remains unaltered regardless of whether button holes to be sewed subsequently to the making of the adjustment are larger or smaller, since the coordination of the stitch-width to the altered button hole length is effected automatically by the attachment of Figs. 5 to 7.

Connected to the slide 17' is a pivot or rotary bolt 52 of a bell-crank lever having arms 50 and 51. The two arms of this bell-crank lever are not integral with each other and can be angularly displaced relative to each other about the bolt 52 and clamped in any desired angular position with respect to each other by means of a screw 53. The lever arm 50 engages by means of a tang or pin 58 in a slot 59a of an extension 59 of the slide 17''.

Consequently, the slide 17'' can be displaced relative to the slide 17', when the latter is retained in fixed posi-

tion by the pin 15 of the control lever 12, through swinging of the bell-crank lever about the bolt 52.

Thus, whenever the slide 17" is so moved that the distance between the tip of the adjustment screw 20' and the edge 19' of the slot 17a in the slide 17' is increased, the stitch width is decreased. Conversely, whenever the distance between the edge 19' and the screw 20' is decreased through appropriate movement of the slide 17" under the action of the bell-crank lever, the stitch-width is increased.

The arm 51 of the bell-crank lever is pivotally connected at 54 to a link element 55, the other end of which is linked or pivotally connected to the adjustment bolt 33. The latter, as in the first described form of the invention, interconnects the lever 28 with the displacement lever 7.

The adjustment lever 28 in the attachment shown in Fig. 7 is not connected directly with the endless rack 24 as is the case with the attachment shown in Figs. 2 to 4. Rather, a link 57 is pivotally interconnected between the adjustment lever 28 and the rack 24 (see Fig. 7).

The attachment illustrated in Figs. 5 to 7 operates to maintain a constant stitch-width for any button hole, regardless of the size thereof, in the following manner. When the position of the adjustment bolt 33 in the slot 31 of the adjustment lever 28 is changed in order to increase or decrease the length of the button hole to be sewed, this change of position is transmitted through the link 55 to the bell-crank lever 50, 51 and from the latter to the slide 17".

If, for example, the bolt 33 is moved to a location closer to the axis of rotation 30 of the adjustment lever 28, so as to enable short button holes to be produced, then the bell-crank lever 50, 51 is swung in a counter-clockwise direction, as seen in Fig. 7, whereby the slide 17" will be moved to the left in Fig. 7. In this manner, the adjustment screw 20' is brought closer to the edge 19' of the slot 17a in the slide 17', so that the working stroke of the control lever 21 of the free-wheel gear 22 is lengthened to correspondingly increase the stitch-width.

Alternatively, when the bolt 33 is moved farther away from the rotation bolt 30 on which the lever 28 is mounted, so as to enable long button holes to be produced, then the bell-crank lever 50, 51 is swung in a clockwise direction and the slide 17' moved to the right in Fig. 7. As a result, the screw 20' is moved farther away from the edge 19' of the slide 17', whereby the stitch-width is decreased. In this manner, the stitch-width can be maintained approximately constant independently of the size of the button hole.

It will be noted that the longitudinal displacement of the endless rack 24 becomes substantially nil at the two curved end portions of the rack. In the absence of the arrangement according to the present invention, the stitch-width at the corresponding end points of the button holes would be reduced to zero. In other words, a considerable piling up of stitches would result which is unseemly in appearance and quite often could cause breaking of the sewing machine needle.

This disadvantage is avoided by the attachment according to the present invention through the coupling of the screw 20' with the adjustment bolt 33. Thus, when the latter traverses, between its two limit positions, the arcuate path prescribed by the relative position of the rotation bolt 30 of the lever 28, then it moves the bell-crank lever up to its end position in a clockwise direction and decreases the stitch-width along the relatively linear portions of the button hole rim.

When, however, the bolt reaches or comes close to its two limit positions, it swings the bell-crank lever 50, 51 in a counter-clockwise direction and thus increases the stitch-width at both ends of the button hole. This prevents the heretofore unavoidable piling up of stitches at the ends of the button hole.

Thus, it will be seen that there has been provided, in accordance with the present invention, a button hole

attachment for use with a sewing machine equipped with a driven needle bar and having movable material displacement means, a lever system for operating said displacement means, an adjustment bolt connected to said lever system to vary the button hole length to be obtained through adjustment of said bolt in longitudinal direction of an adjustment lever forming a part of said lever system, comprising a control lever operated by said needle bar, reciprocable slide means operated by said control lever, a free-wheel drive actuable by said slide means and operatively connected to said lever system, said slide means being provided with a fixed dog and with an adjustable dog for actuating said free-wheel drive upon reciprocal movement of said slide means, the distance between said dogs being adjustable to determine the spacing between stitches of the button hole being sewed, means pivotally coupling said adjustable dog with said bolt in such manner that said adjustable dog is automatically displaced relative to said fixed dog upon predetermined location of said adjustment bolt relative to said adjustment lever to thereby cause said control lever to impart to said material displacement means a motion for obtaining a substantially constant spacing between stitches independently of the length of the button hole being sewed.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. In a button hole attachment for use with a sewing machine equipped with a driven needle bar and having movable material displacement means, a lever system for operating said displacement means, an adjustment bolt connected to said lever system to vary the button hole length to be obtained through adjustment of said bolt in longitudinal direction of an adjustment lever forming a part of said lever system; a control lever operated by said needle bar, reciprocable slide means operated by said control lever, a free-wheel drive actuable by said slide means and operatively connected to said lever system, said slide means being provided with a fixed dog and with an adjustable dog for actuating said free-wheel drive upon reciprocal movement of said slide means, the distance between said dogs being adjustable to determine the spacing between stitches of the button hole being sewed, means pivotally coupling said adjustable dog with said bolt in such manner that said adjustable dog is automatically displaced relative to said fixed dog upon predetermined location of said adjustment bolt relative to said adjustment lever to thereby cause said control lever to impart to said material displacement means a motion for obtaining a substantially constant spacing between stitches independently of the length of the button hole being sewed.

2. In a button hole attachment according to claim 1, said slide means comprising a pair of slide members, a first slide member and a second slide member, said fixed dog being provided on the first of said slide members, said adjustable dog being disposed on said second slide members, means for positively coupling said slide members for joint displacement with each other as well as for relative displacement with respect to each other, whereby the distance between said dogs may be changed.

3. In a button hole attachment according to claim 2, said coupling means including a bell-crank lever fulcrumed on said second slide member having one arm operatively connected with the first of said slide members, and having another arm coupled with said adjustment bolt.

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