

**Sept. 29, 1953**

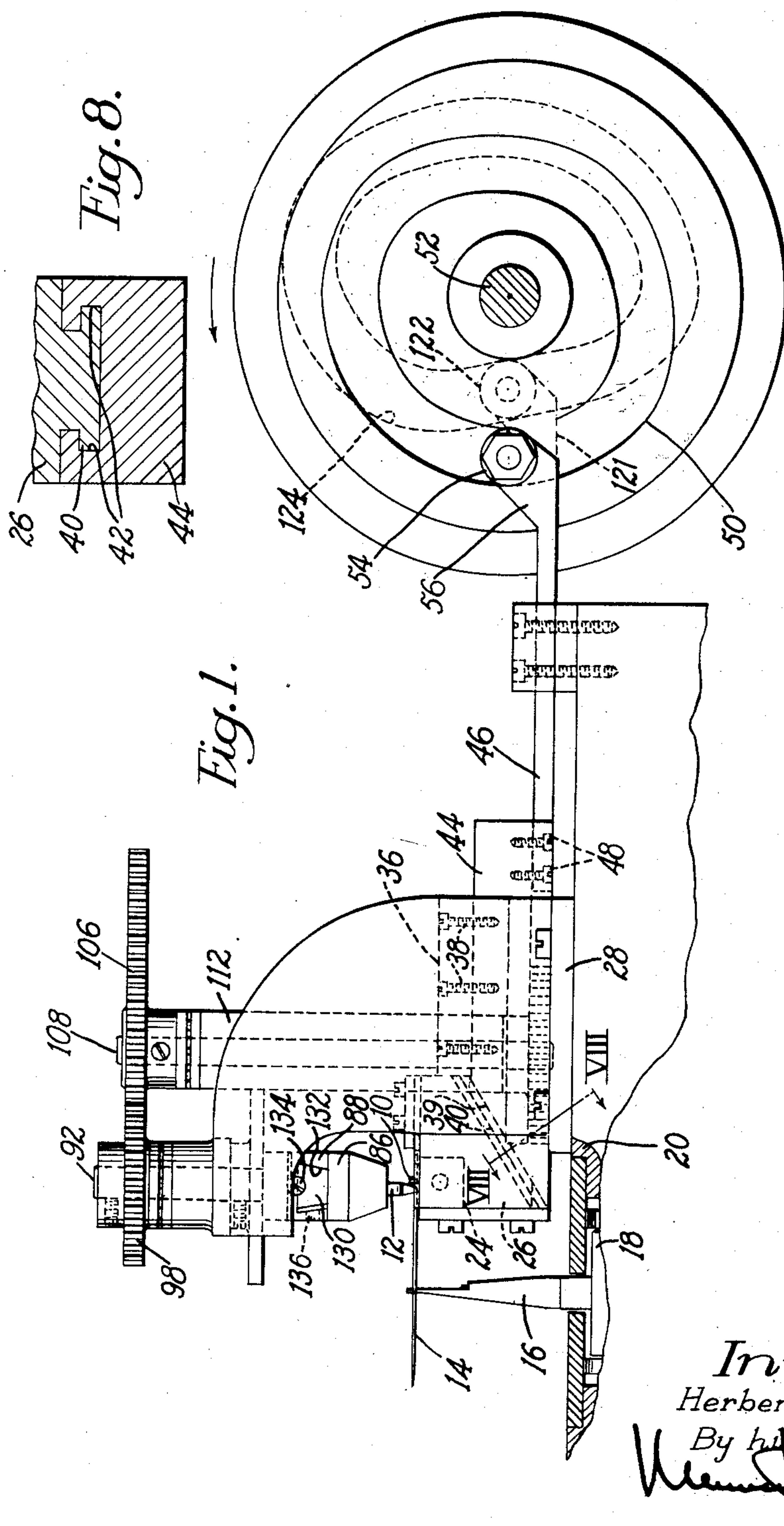
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**2,653,632**

## EYE FORMING MECHANISM

Filed Sept. 3, 1949

3 Sheets-Sheet 1



**Sept. 29, 1953**

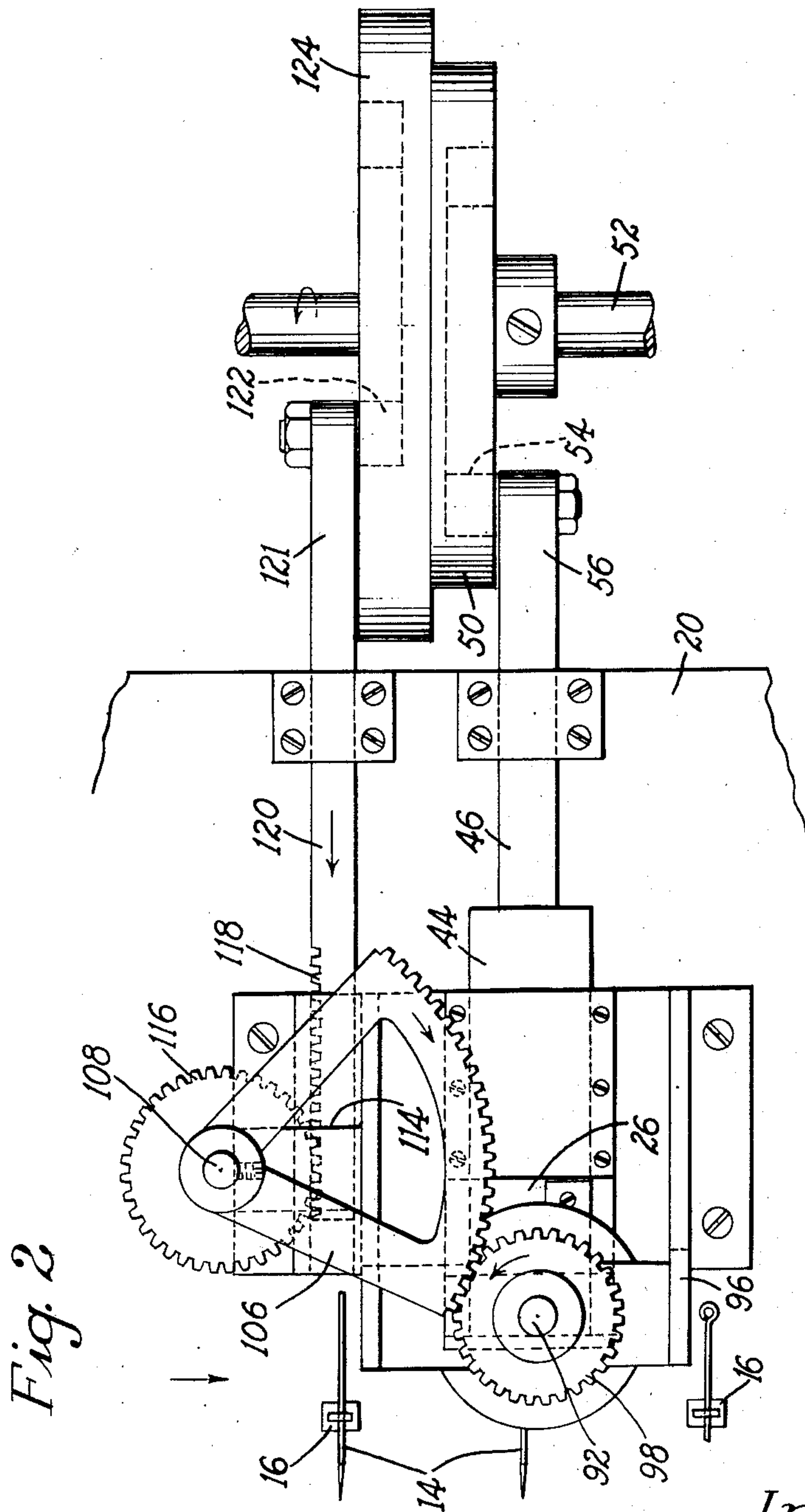
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## EYE FORMING MECHANISM

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EYE FORMING MECHANISM

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Fig. 3.

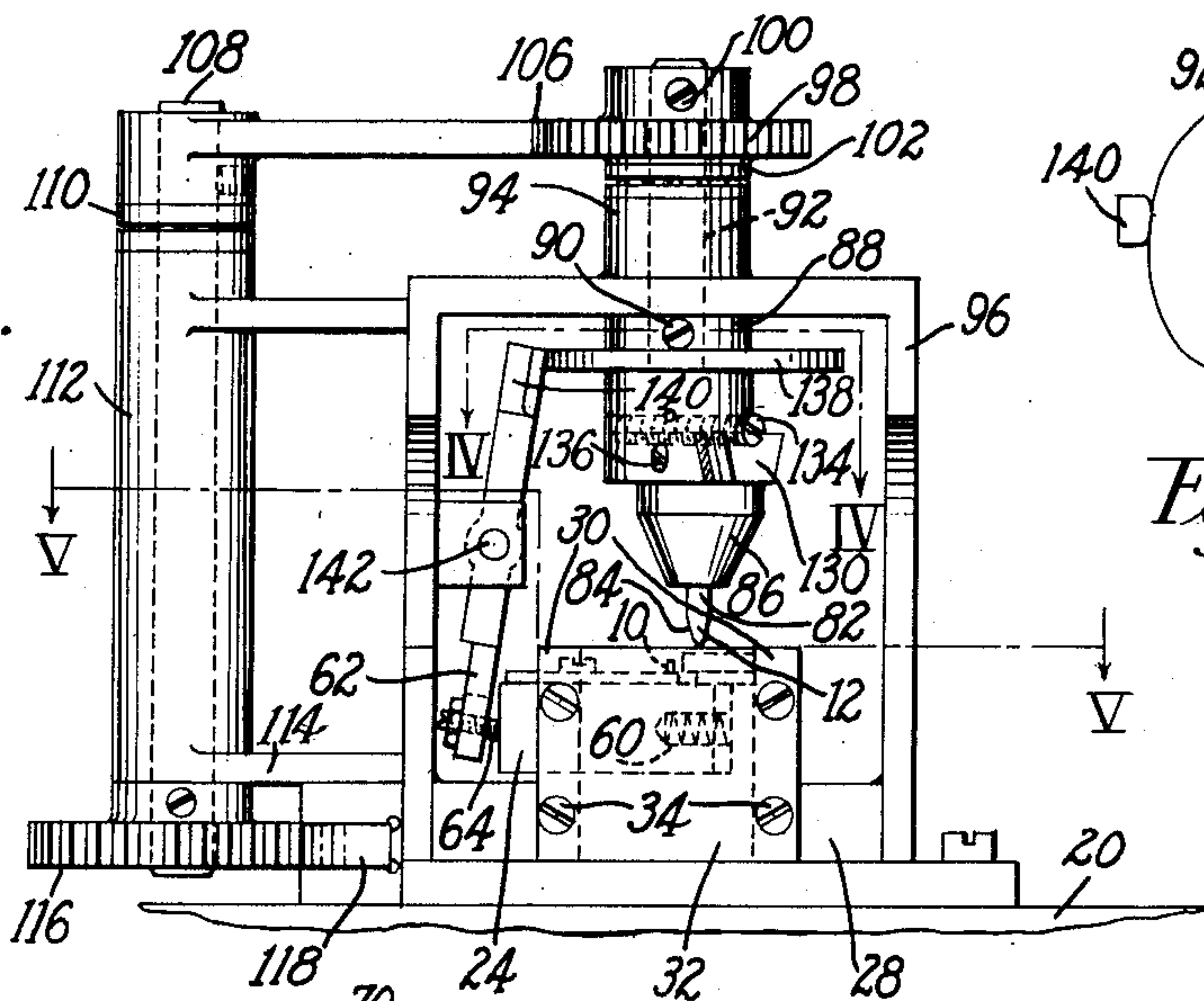


Fig. 4.

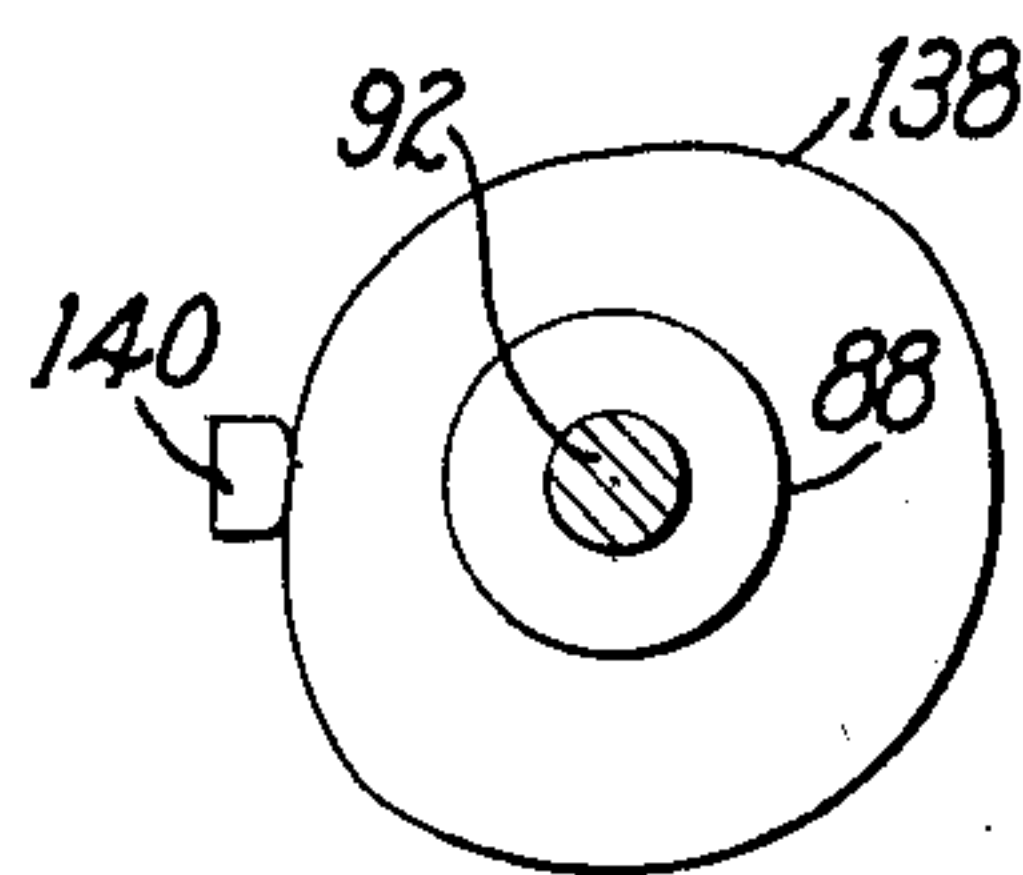


Fig. 6.

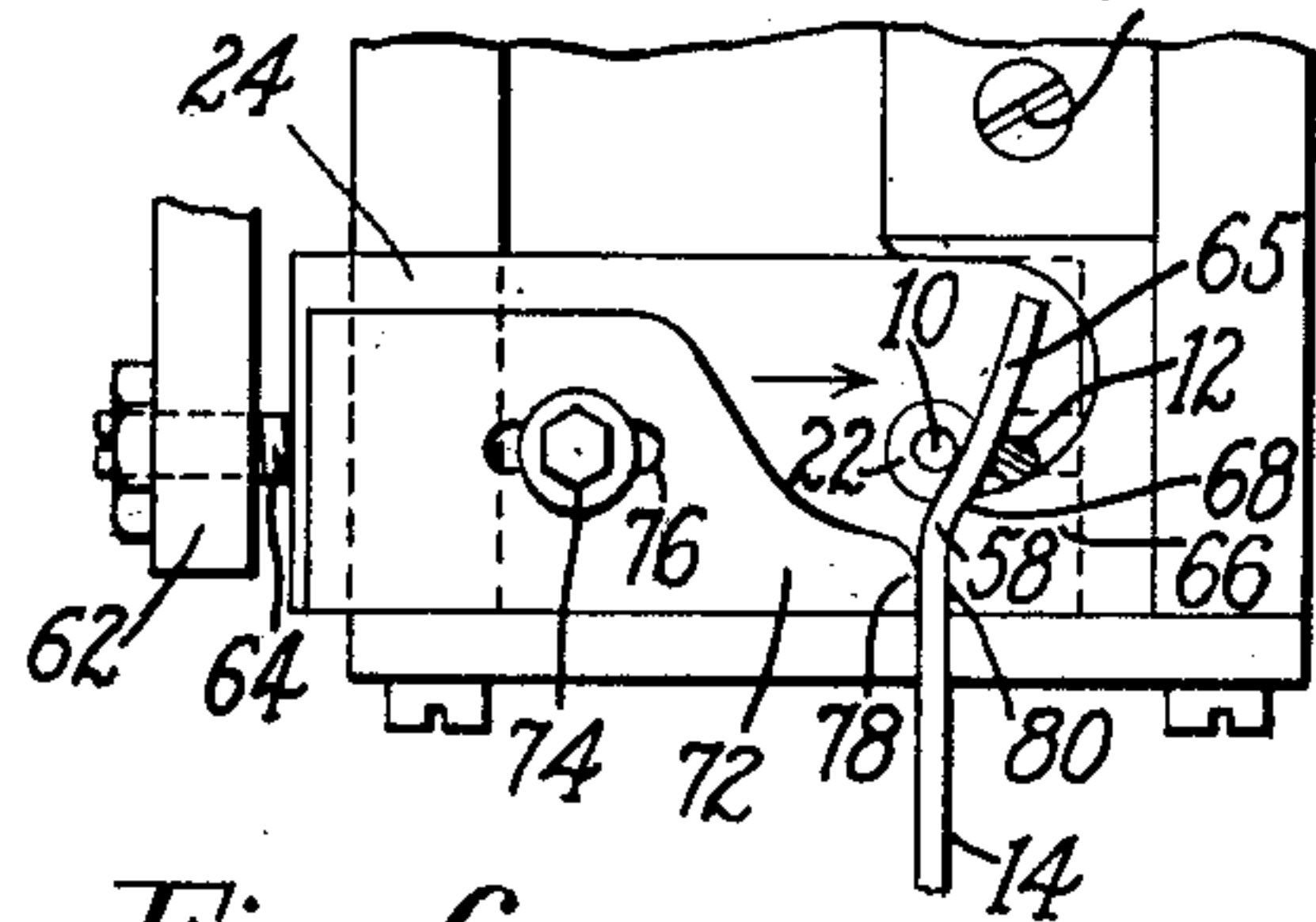


Fig. 5.

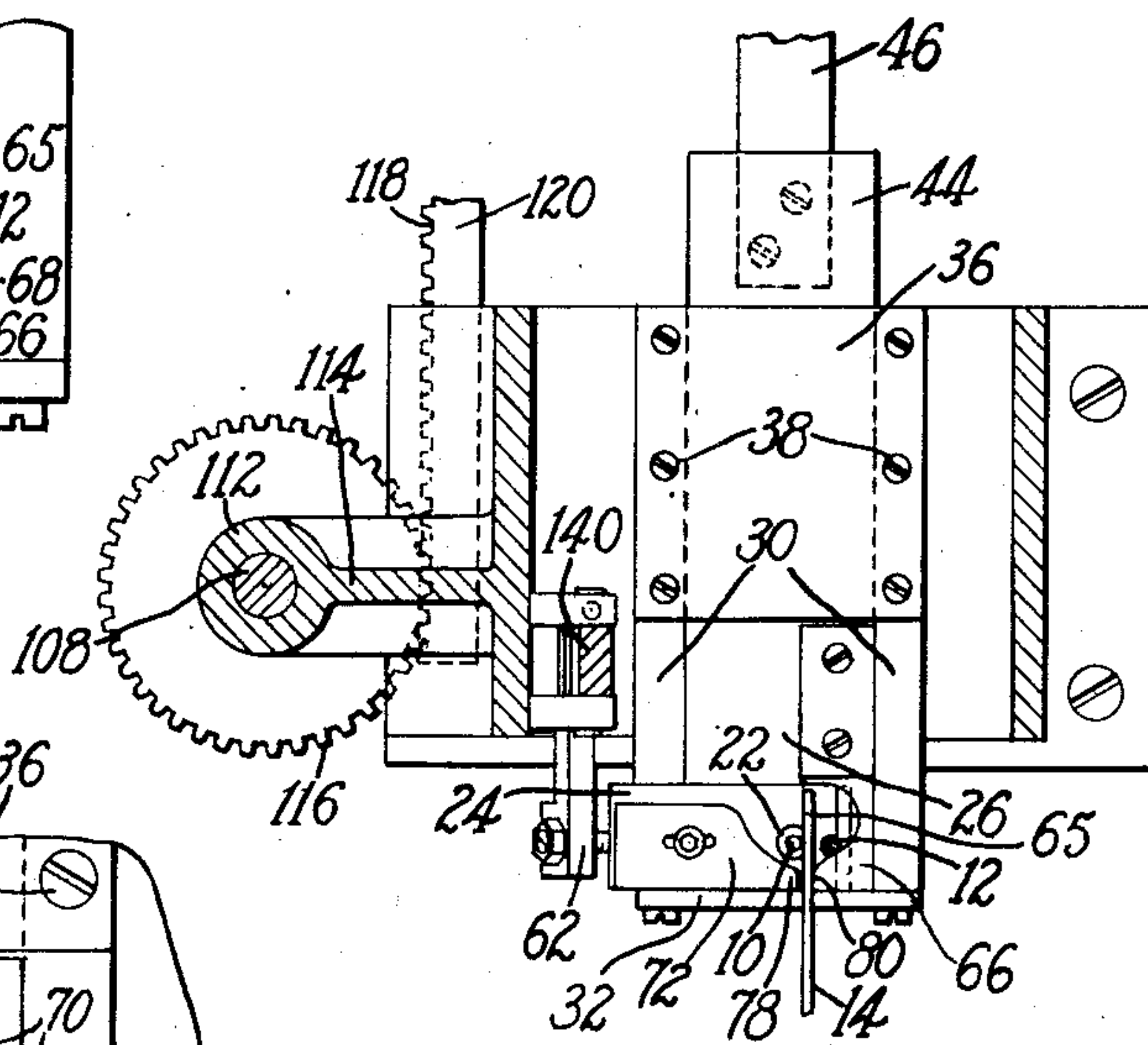
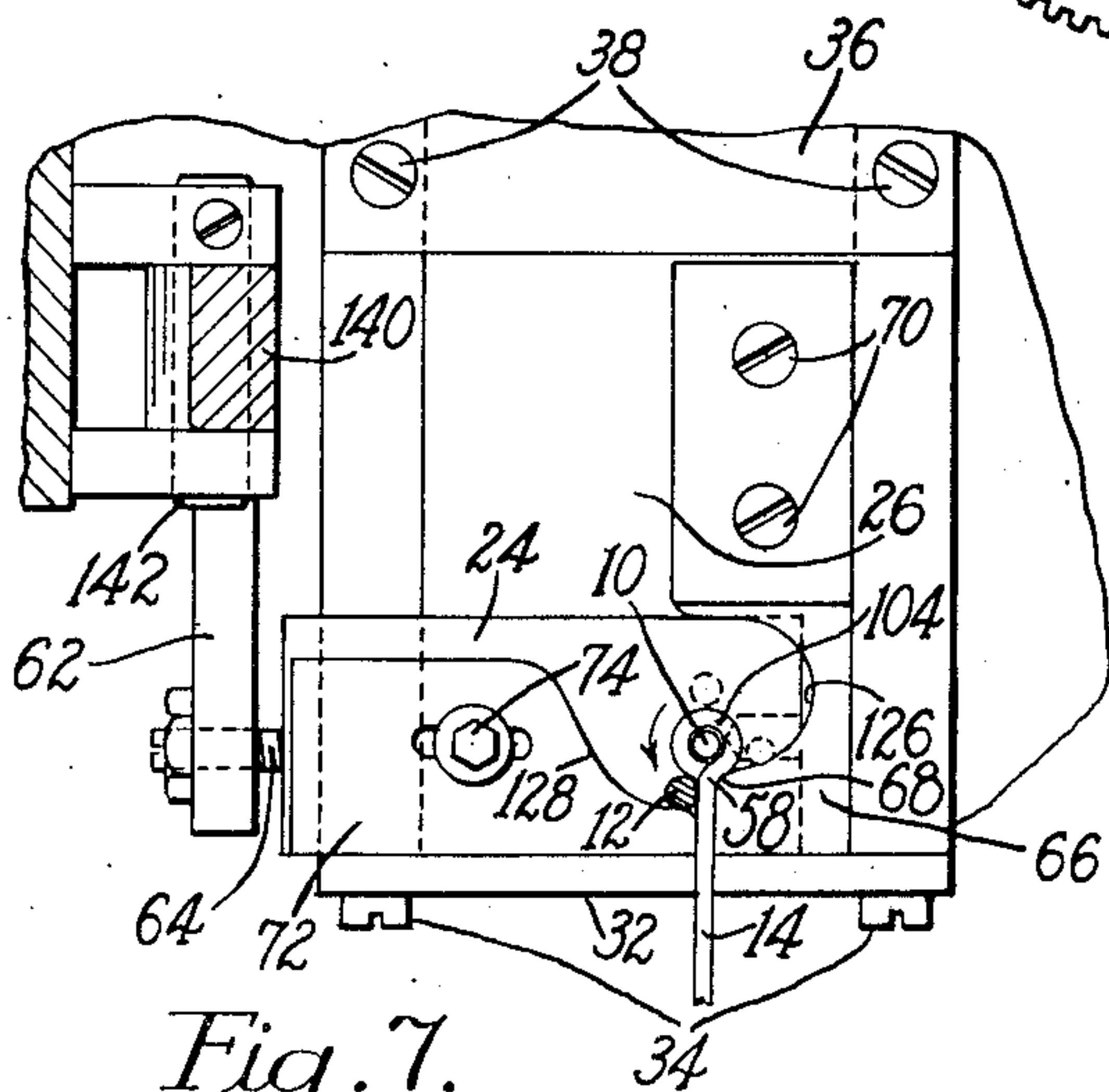


Fig. 7.



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# UNITED STATES PATENT OFFICE

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## EYE FORMING MECHANISM

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Application September 3, 1949, Serial No. 114,039

6 Claims. (Cl. 140—104)

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This invention relates to eye forming machines and is herein illustrated as embodied in a machine for forming eyes in fishhook blanks.

In automatic fishhook making machines as heretofore constructed wire blanks are commonly advanced intermittently from one operating instrumentality to another, one of the several operations necessary to produce completely formed hooks being performed by each instrumentality. The eyeing operation in many instances limits the rate of production of the entire machine because of the fact that several eye forming tools must be successively caused to operate upon a blank during the time between blank feeding movements.

In view of the foregoing, it is an object of the invention to provide an improved eye forming machine which will be effective to form accurate and uniform eyes in wire blanks and which at the same time will be rapid in its operation.

To this end, and as illustrated, the invention provides, in a machine of the type referred to, a support for holding a blank in horizontal position, and a retractable stud about which an eye is to be formed, the stud being normally located in an inoperative position below a horizontal plane through the blank but movable into the plane of the blank, together with a forming tool mounted for movement about a vertical axis extending through the blank for engaging an end portion of the blank to bend the same about the stud to form an eye.

Preferably, and as shown, means is provided for moving the stud laterally into alinement with the vertical axis thus engaging the blank to form an initial bend or offset therein prior to operation of the forming tool.

The machine above described can be operated at high speed; the construction and arrangement of the stud and its associated mechanism facilitates presentation and removal of blanks; and the mechanism for forming an initial bend or offset in the blank contributes to the production of accurate and uniform eyes.

These and other features of the invention are disclosed in the following specification and in the accompanying drawings, and are pointed out in the claims.

In the drawings,

Fig. 1 is a side elevation, partly in section, of an eye forming machine illustrating one embodiment of the invention;

Fig. 2 is a plan view of the machine;

Fig. 3 is a front elevation of the machine;

Fig. 4 is a section taken along line IV—IV of Fig. 3;

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Fig. 5 is a section taken along line V—V of Fig. 3, showing the positions of the parts prior to a forming operation;

Fig. 6 is a plan view of a portion of the machine illustrating the initial bending operation;

Fig. 7 is a plan view of a portion of the machine illustrating operation of the forming tool in completing an eye; and

Fig. 8 is a cross-sectional view taken along line VIII—VIII of Fig. 1.

The illustrated machine comprises forming mechanism including a stud 10 and a forming tool 12 operable to engage end portions of a fishhook blank, such as blank 14, to bend the same around the stud and thus produce an eye. Conveniently, blanks are presented one at a time in horizontal position to the forming mechanism by chucks 16 mounted upon a conveyor 18 on the base 20 of the machine.

The stud 10 which is preferably of somewhat greater diameter than that of a blank in which an eye is to be formed, has an enlarged base 22, Figs. 5 and 6, which is set in the upper surface of a slide in the form of a block 24 mounted for movement transversely of a platen 26. The platen is slidably mounted on a bracket 28, supported by the frame, and having upstanding side walls 30, Fig. 3, embracing the platen. An end plate 32 secured to the walls 30 by screws 34, and a cover plate 36, Figs. 1 and 5, secured to the walls 30 by screws 38 engage front and rear portions of the platen, thus limiting the platen to movement heightwise of the bracket.

Means is provided to accomplish movement of the platen 26 heightwise relatively to the bracket 28, particularly for the purpose of presenting the stud 10 into operative position in the plane of a blank 14 carried by a chuck 16, and to permit lowering the stud to provide clearance for movement of a blank toward and past the eyeing mechanism. When the blank has been positioned toward the eyeing mechanism, movement of the platen raises the stud into operating position and movement of the associated block causes the stud to form the first portion of the eye; whereafter, movement of the bending pin completes the eye, and the following downward movement of the stud on the platen mechanism strips the eye from the stud, ready for movement to the next position. Accordingly, the underside of the platen is slanted off at an angle of about 30° to the horizontal, as at 39, Fig. 1, and its lower portion is provided with a tongue 40, Fig. 8, slidable in grooves 42 in a block 44 which is in turn slidable on the bracket 28 between the side walls 30 and beneath the



cover plate 36. The block 44 is reciprocated by a link 46 secured to the block by screws 48, the reciprocating movement being under the control of a rotary cam 50, on a drive shaft 52, and which engages a roll 54 on an arm 56 on the link. By this mechanism the platen 26 and the stud 10 carried thereby can be intermittently brought from an inoperative position below a horizontal plane through the blank to be operated upon, into a plane in which the stud extends in lateral alignment with the blank.

Figs. 1 and 5 show the platen 26 in raised position with the stud 10 in operative position relatively to a blank 14 about to be operated upon, the stud being located to the left of the blank, Fig. 5.

A preliminary operation is performed upon each blank 14 to form an offset or shoulder, indicated by reference character 58, Fig. 6. To accomplish this, the slide 24, carrying the stud 10, normally urged to the left, Fig. 3, by a spring 60 is arranged to be moved positively a short distance to the right by a power driven lever 62 carrying an adjustment screw 64 engaging an end face of the slide. This causes a movement to the right, Fig. 6, of the stud 10, sufficiently to bend the end portion 65 of the blank 14 partly along a forming plate 66 having a curved shoulder forming portion 68. The plate 66 is fixedly secured to the platen 26 by screws 70, Figs. 6 and 7. In order to hold the body portion of blanks 14 against lateral movement during the initial eye forming operation, there is provided a plate 72, secured to the slide 24 by a screw 74 extending through an elongated slot 76 in the plate. The plate 72 has a nose portion 78 adapted to engage the blank below the portion where the shoulder is to be formed and to clamp it against a straight edge portion 80 of the plate 66 when the slide 24 is moved to the right, in Fig. 6. It is to be noted that the plate 72 is secured in adjusted position on the slide 24 when the latter is positioned to the left, Fig. 5, so that there will be clearance between the nose portion 78 and the blank when the plate 72 is raised upwardly with the platen 26.

The forming tool 12 has a vertically extending shank portion 82 terminating in a tapered and rounded end portion 84, Fig. 3. The shank portion of the tool is mounted in a collet 86 upon the lower end of a bushing 88, secured by a screw 90 to a vertical spindle 92. The spindle extends upwardly through a sleeve 94 mounted on an upstanding bracket 96 the lower end of which is secured to the bracket 28. The upper end of the spindle carries a pinion 98 secured thereto by a screw 100. The weight of the spindle and its associated parts is carried by a thrust bearing 102 positioned between the pinion 98 and the upper end of the sleeve 94.

The spindle is rotated to swing the forming tool 12 through an arc of about 260° in wrapping the end portion 65 of the blank, Fig. 6, around the stud 10 to complete the eye 104 as shown in Fig. 7. To this end, as shown in Figs. 2 and 3, the pinion 98 is in mesh with a gear segment 106 on a vertical shaft 108, the segment resting upon a bearing 110 carried at the upper end of a sleeve 112, surrounding the shaft, and secured to an extension 114 of the bracket 96. At its lower end the shaft 108 has pinned to it a pinion 116 meshing with a rack 118 on a slide link 120. The link has an arm 121 which carries

a roll 122, Fig. 2, in engagement with a cam 124 on the drive shaft 52.

The cam 124 is designed to effect arcuate movement of the forming tool 12 about the stud from the dotted line position shown at the right of the stud, Fig. 7, to the full line position shown, and then to return the tool to its original position.

It is to be noted that the plates 66 and 72 are cut away at 126 and 128 respectively to provide for clearance of the tool during its arcuate movement.

It is to be noted that the curved portion 68 of the plate 66 is so shaped that the shoulder 58 formed in the blank along it is a symmetrical part of the circular portion of the eye produced by the forming tool.

In order to provide for adjustment of the position of the forming tool 12 in producing eyes of varying sizes the collet 86 has at its upper end a tongue 130, Figs. 1 and 3, slidably mounted in a radial groove 132 in the bushing 88, the eccentric position of the tool 12 being adjusted by a screw 134 rotatable in the bushing and making threaded engagement with the upper face of the tongue. The tool is locked in adjusted position by a set screw 136.

Means for moving the slide 24 in timed relation to operation of the platen 26 and the forming tool 12 comprises a cam 138, Figs. 3 and 4, carried by the bushing 88, and arranged to engage a lever 140 pivoted at 142 on the bracket 96, and to the lower end of which is secured the lever 62.

The conveyor 18 is not described in detail since it involves subject matter covered by my copending application, Serial No. 122,527, filed October 20, 1949, now abandoned. A series of chucks 16 supporting blanks 14 is shown diagrammatically in Fig. 2, it being understood that the conveyor advances the chuck intermittently in the direction of the arrow to present the blanks successively in horizontal position and intersecting the axis of rotation of the forming tool 12.

The operation of the cam 50 is so timed that the platen 26 is in retracted position prior to and after an operation of the forming tool with the result that the stud 10 is withdrawn from the path of movement of the blanks to provide clearance for the blanks during their feed movements. The operation of the cam 124 is so timed that after an operation of the tool 12 in forming an eye the tool is held momentarily in the full line position shown in Fig. 7 while the platen is depressed to strip the stud 10 from the blank and the blank is advanced, after which the tool 12 is returned to the position shown in Fig. 5.

In summarizing the operation of the machine, blanks are successively positioned by the conveyor 18 with the inner end portion of each blank, as shown in Fig. 5, extending over the slide 24 on the platen 26 and intersecting the axis of rotation of the forming tool 12. The platen is then raised through operation of the cam 50, link 46 and block 44, so that the slide 24 engages the underside of the blank and the stud 10 and plates 66 and 72 are brought into the plane of the blank. The slide 24 is then moved laterally of the platen 26, Fig. 6, through operation of the cam 138 and lever 62 causing the movable plate 72 to force the blank against the fixed plate 66 and causing the stud 10 to bend the blank along the curved portion 68 of the plate 66 to form a shoulder 58 in the blank. The forming



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tool 12 is then moved about the stud through operation of the cam controlled rack 113, shaft 108 and gear 106, to engage and bend the end portion 55 of the blank about the stud to complete the eye 104. The slide 24 is then released, and the platen is retracted, stripping the stud from the eye, after which the blank is advanced by the conveyor and the forming tool is returned to its original position.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. An eye forming machine comprising a frame member, a vertically extending bending pin member having a blank engaging end portion, a shaft for mounting the bending pin for movement about a vertical axis, the axis of said bending pin being displaced laterally from the axis of said shaft and both being carried on said frame, a vertically movable platen, a slide carried by the platen mounted for movement transversely of the platen, a vertical stud carried by the slide both being carried in operative relationship by said frame, means also carried by said frame for moving the platen heightwise of the bending pin member to present the stud into operative position in horizontal alinement with the blank engaging portion of said bending pin and after formation of the eye to strip the formed blank from the stud, means also mounted on said frame for supporting a blank in horizontal position adjacent to the bending pin, means attached to said frame for moving the slide toward a fixed forming member to cause the stud to form an initial bend in the blank, and means on said frame for moving the bending pin about the said shaft axis to bend the end of the blank about the stud to form an eye.

2. In a machine for forming eyes on fishhook blanks, a frame, a chuck supported thereon for supporting a fishhook blank in horizontal position, a platen also supported thereon, a stud projecting upwardly from the platen, means carried on said frame for moving the platen upwardly to bring the stud into the horizontal plane of the blank, means also carried on said frame for moving the stud transversely of the blank and downwardly to strip the eye from the stud toward a fixed member to cause the stud initially partially to form the eye in the end portion of the blank, a vertical shaft supported on said frame and a bending pin mounted on said shaft for movement about a vertical axis, but displaced therefrom, and means also attached to said frame for moving the bending pin to engage and move the end portion of the blank about the stud and thus complete the eye.

3. An eye forming machine comprising a frame member, a support for holding a blank in horizontal position attached to said frame, a bending pin and a shaft for the support thereof mounted upon said frame for movement about a vertical axis extending through the blank, the axis of the pin being displaced from the axis of the shaft, a platen also mounted upon said frame for movement heightwise of the blank, a slide mounted on the platen for movement transversely of the blank toward a fixed member, a vertical stud carried by the slide and movable therewith into alinement with the vertical shaft axis, means also carried on said frame for moving the platen to present the stud into the horizontal plane of the blank and after forming, to strip the eye from the stud, means supported upon said frame for

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moving the slide in a direction to cause the stud to engage the blank and form a shoulder therein, and means attached to said frame for moving the bending pin to bend an end portion of the blank about the stud and thus complete the eye.

4. An eye forming machine comprising a frame, a support mounted thereon for holding a blank in horizontal position, a bending pin and a shaft for the support thereof attached to said frame, mounted for movement about a vertical axis extending through the blank, the axis of the pin being displaced from the axis of the shaft, a platen also carried on said frame, and mounted for movement heightwise of the blank, a slide mounted on the platen for movement transversely of the blank toward a fixed forming member, a vertical stud carried by the slide movable therewith into alinement with the vertical axis, a plate secured to the platen and having a blank engaging portion, means attached to said frame for moving the platen to present the stud into the plane of the blank, for the forming operation, and thereafter to strip the eye from the stud, means likewise attached to said frame for moving the slide in a direction to cause the stud to engage the blank and form a shoulder therein along the plate, and means similarly attached to said frame for moving the bending pin to bend an end portion of the blank about the stud and thus complete an eye.

5. An eye forming machine comprising a frame, a support attached to said frame for holding a blank in horizontal position, a bending pin and shaft for the support thereof mounted on said frame for movement about a vertical axis extending through the blank, the axis of the pin being displaced from the axis of the shaft, a platen also mounted on said frame for movement heightwise of the blank, a slide mounted on the platen for movement transversely of the blank, a vertical stud carried by the slide and movable therewith into alinement with the vertical axis for the eye bending operation and out of alinement for stripping the eye from the stud, a plate secured to the platen and having a blank engaging portion, an abutment on the slide, means also mounted on said frame for moving the platen to present the stud into the plane of the blank, means likewise mounted on said frame for moving the slide in a direction to cause the abutment to hold the blank against the plate and to cause the stud to engage the blank and form a shoulder therein along the plate, and means similarly mounted on said frame for moving the bending pin to bend an end portion of the blank about the stud to complete an eye.

6. An eye forming machine comprising a frame member, a vertically extending bending pin member having a blank engaging end portion, a shaft member supported on said frame for mounting the bending pin for movement about a vertical axis, the axis of said bending pin being displaced laterally from the axis of said shaft, a vertically movable platen carried by said frame and having a forming stud carried thereon, means also supported by said frame for moving said platen heightwise of said stud to present the stud into operative position for the forming of the eye and for retracting said stud from operative position for stripping the formed eye from said stud, movement being between positions in horizontal alinement of the stud with the bending pin and below said horizontal alinement sufficiently to permit entry and exit of the blank before and after forming, means also carried by said frame for



supporting a blank in horizontal position adjacent to said bending pin, and means mounted on said frame for moving the bending pin about the said shaft axis to bend the end of the blank about the stud to form an eye.

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