

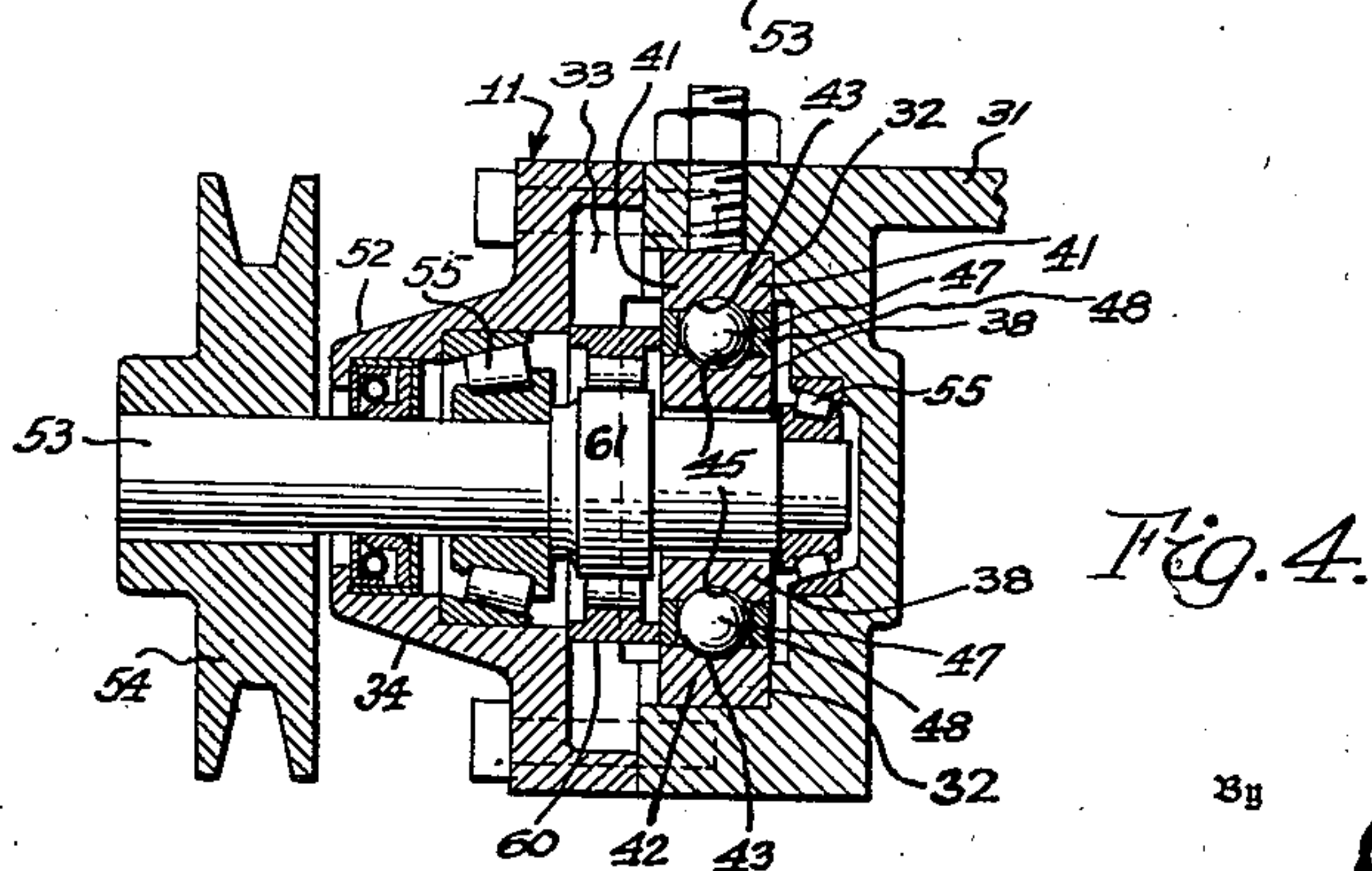
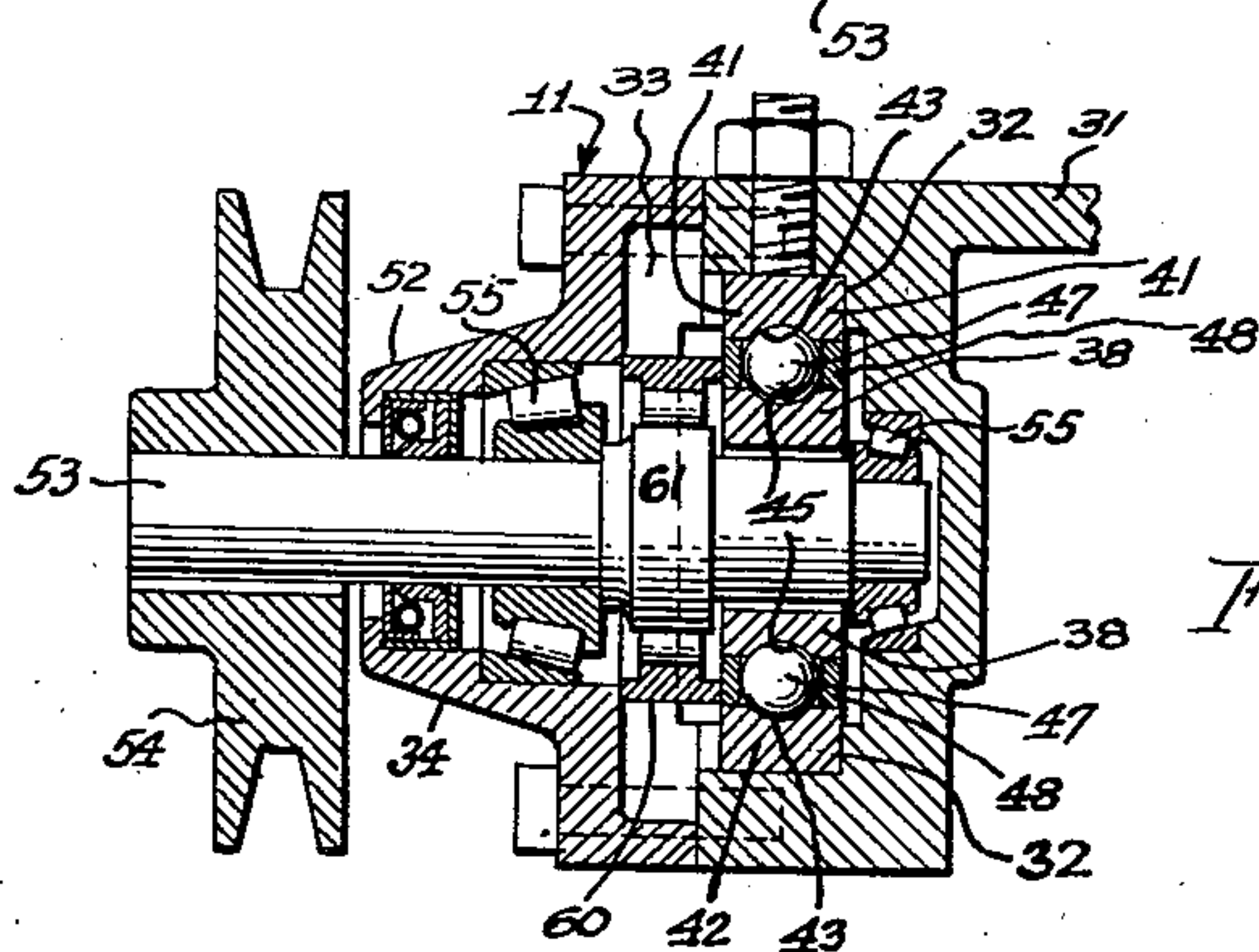
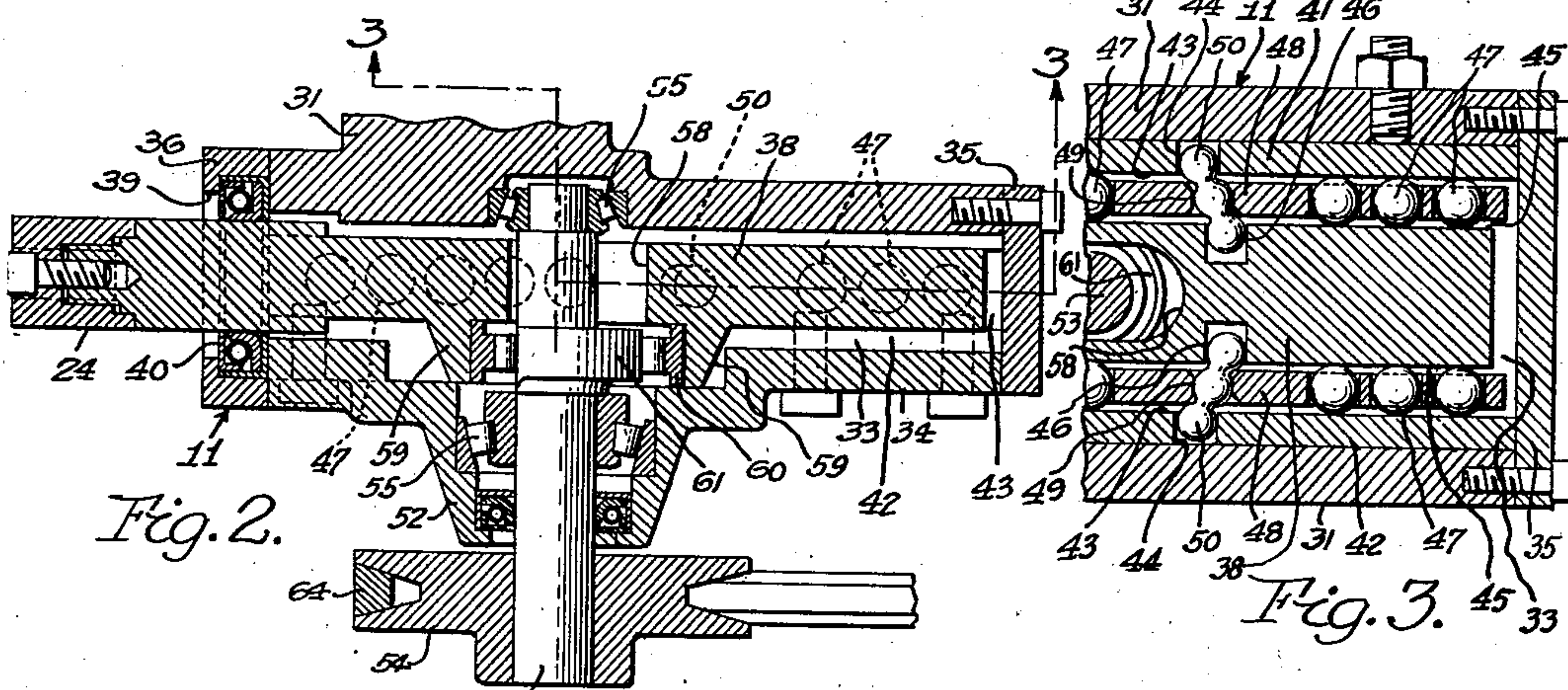
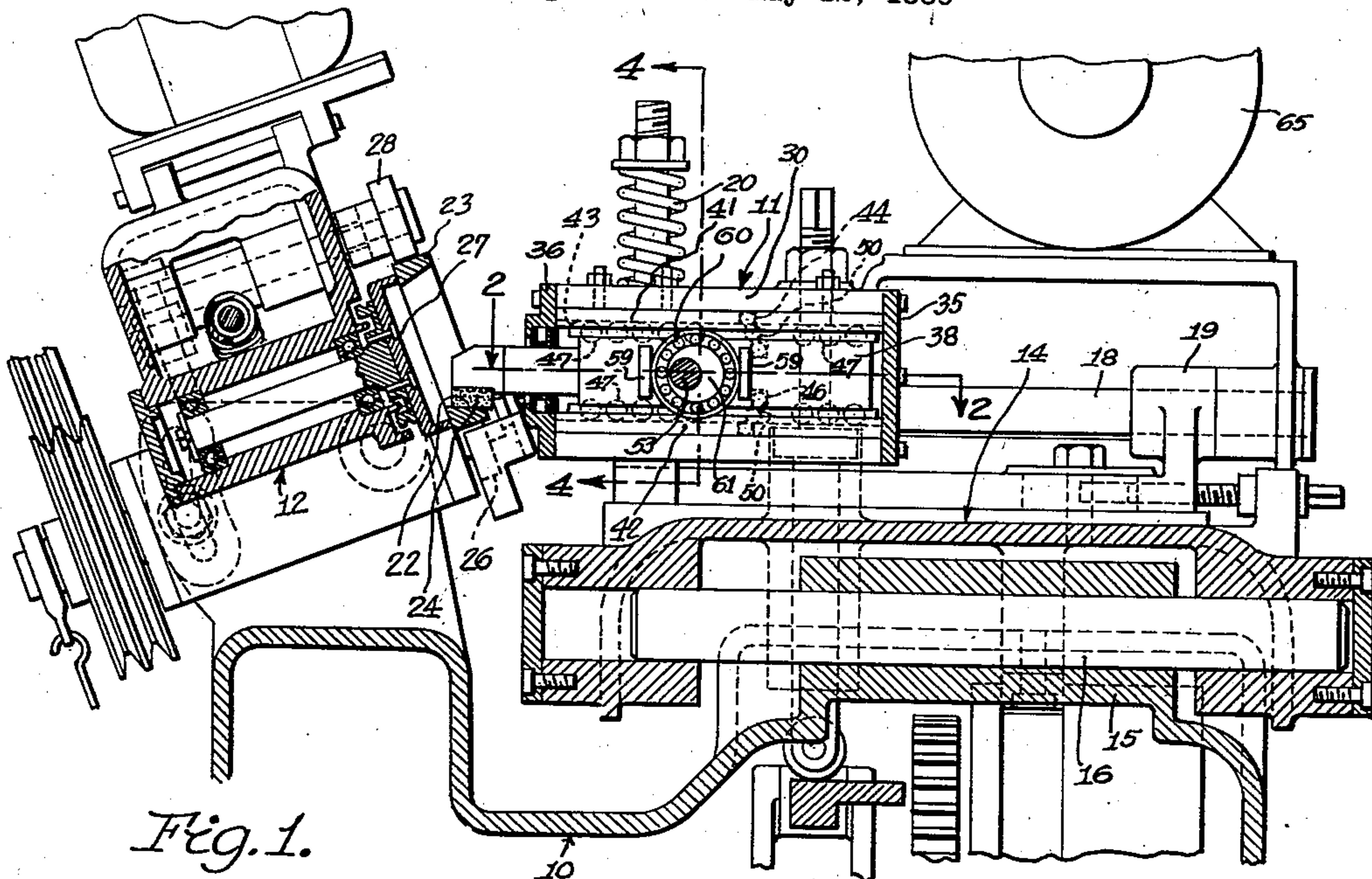
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TOOL SUPPORT FOR CUTTING MACHINES

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TOOL SUPPORT FOR CUTTING MACHINES

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273,308. Divided and this application Septem-
ber 20, 1939, Serial No. 295,784

1 Claim. (Cl. 308—6)

This invention relates, in general, to centerless honing apparatus and, in particular, to a new and improved tool supporting structure therefor, this being a division of my co-pending application filed May 12, 1939, Serial No. 273,308.

One of the objects of the present invention is to improve the tool supporting structure of a honing machine so that friction between the relatively movable parts comprising said structure is minimized.

Another object is to improve the tool supporting structure of a honing machine so that possibility of self-displacement of certain of the movable parts comprising said structure from the most efficiently operable positions therefor is eliminated.

Another object is to improve the tool supporting structure of a honing machine so that friction between the relatively movable parts comprising said structure is minimized and possibility of self-displacement of certain of said parts from the most efficiently operable positions therefor is eliminated.

Another object is to provide a honing machine with a new and improved tool supporting structure which minimizes the friction set up by reciprocation of the tool supported thereby and which prevents certain of the movable parts comprising said structure from being displaced from their positions of greatest operating efficiency, which displacement would otherwise occur at relatively high speeds of said reciprocation.

Other objects and advantages of the invention will become readily apparent from a reference to the following specification taken in conjunction with the accompanying drawing in which:

Figure 1 is a vertical section taken longitudinally through the honing machine, shown partly in elevation and partly broken away, and showing the tool in honing position with respect to the work piece;

Figs. 2 and 4 are sections taken along the lines 2—2 and 4—4, respectively, in Fig. 1; and

Fig. 3 is a section taken along the lines 3—3 in Fig. 2.

Since the present invention relates solely to the structure which directly supports the tool, disclosure of only those elements and arrangements thereof comprising said structure is set forth in detail herein, it being understood that reference can and will be made to the aforementioned copending application for obtaining a detailed and complete showing and explanation of the honing machine and its operation. How-

ever, for the purpose of showing the contemplated use of the tool supporting structure and of the tool supported thereby, Fig. 1 is presented and shows such use to be the honing by said tool of the raceway of an annular bearing member which is supported by a centerless type of work supporting structure.

So, with the presumption that portions of the following description will be considered in conjunction with the aforementioned co-pending application, it will be noted in Fig. 1 that the honing machine comprises, in general, a main base 10 which supports, in operable inter-relationship, a tool supporting structure 11 and a work supporting structure 12. A table, generally indicated at 14, interconnects the base 10 and tool supporting structure 11, by means of hollow guide bosses 15 integral with said base and by means of guide rods 16 carried by said table and cooperable with said bosses, and is purely reciprocable relatively to said base between predetermined limit positions therefor. Though the table 14 supports the tool supporting structure 11 for reciprocation of the latter by and with the former, there is provided a pivotal connection therebetween which consists of a rod 18 and a bearing 19 therefor, so that said structure may be pivoted about the axis of said rod toward and away from said table, which is, as has been said, purely reciprocable. A spring 20, cooperating with the tool supporting structure 11, is employed for urging said structure toward its lower position with respect to the table 14 in opposition to the means employed for raising said structure.

The unitary, reciprocal travel of the table 14 and tool supporting structure 11 is horizontal and in parallelism with the raceway surface 22 of an annular bearing member or work piece 23 externally supported for rotation about its axis by means of the work supporting structure 12. This reciprocation of the unit 14—11 is between two points one of which disposes the tool, which is indicated at 24 and carried by the structure 11 of said unit, inwardly of the inner edge of the raceway 22 and the other of which disposes said tool outwardly of the outer edge of said raceway. Movement in this manner of the tool 24 from the above mentioned outer position therefor to the above mentioned inner position therefor occurs while the structure 11 is in its raised position with respect to the table 14 for the purpose of radially aligning said tool with the raceway 22 for subsequent lowering of said tool into honing position on said raceway, and move-

ment of said tool from said inner position to said outer position is not commenced until said tool has been raised from said honing position into said inner position. The mechanism by which the component parts 14 and 11 of the unit 14—11 are unitarily reciprocated, relatively pivoted and accurately timed in these movements forms no part of the present invention and is, therefore, neither shown nor will be further discussed herein, the aforementioned co-
 5 pending application being thought the proper source of such information, if desired.

The work supporting structure 12, in short, is of the centerless type, that is, it externally supports and rotatably drives the work piece 23
 15 about its axis of rotation so that the raceway 22 will rotate past the lowered, reciprocating tool 24 in honing engagement therewith for being honed thereby. For this purpose, structure 12 comprises a pair of axially spaced, rotating, supporting rollers 26 which support and rotatably drive the work piece 23 from beneath, a rotatable backing member 27 which supports said work piece from behind and limits axial movement thereof, and a pressure roller 28 which
 20 supports said work piece from above and establishes a driving pressure between the latter and said rollers 26. Though not shown herein, mechanism is provided for raising the pressure roller 23 to permit the insertion of a new work piece
 25 23 into position for honing thereof, for removing the honed work piece 23 from honing position, and for timing these operations with respect to each other and with those of the components 14 and 11 of the unit 14—11.

The tool supporting structure 11 comprises a casing 30 which is elongated in the direction of reciprocation of the unit 14—11 and has a rear section 31 which is operatively connected to the rod 18 and to the table 14 so as to cause said
 40 casing to reciprocate with said table and to swing upwardly and downwardly relatively thereto. Casing section 31 is rearwardly recessed, as at 32, along the front thereof so as to provide a closed, horizontal, longitudinally extending chamber 33
 45 upon the connection to said section of a front casing section 34 and a pair of end casing sections 35 and 36. Carried within the chamber 33 is an elongated tool carrier 38 one end of which extends outwardly from said chamber through
 50 an opening 39 provided therefor in the end casing section 36, this extending carrier end removably carrying in any well known manner the tool 24 and being preferably support at said opening in packing means 40. Fixedly attached to the inner
 55 side of the upper chamber-forming portion of the casing section 31 is an elongated plate 41, and to the inner side of the lower chamber-forming portion of said section is fixedly attached another and similar elongated plate 42, said plate 41 re-
 60 siding above and being spaced from the carrier 38, and said plate 42 residing below and also being spaced from said carrier. Plates 41 and 42 extend the entire length of the chamber 33 and each, preferably, for purposes to be discussed
 65 presently, is centrally formed therealong with a recess or raceway 43 which faces the carrier 38. However, whether or not the plates 41 and 42 are provided with these recesses 43, each is at least provided with one or more sockets or open-
 70 ings 44 which are preferably arranged in vertical alignment with each other.

The upper and lower sides of the tool carrier 38 are preferably formed centrally therealong with recesses or raceways 45 which face and

reside in vertical alignment with the recesses or raceways 43 in the plates 41 and 42, and said tool carrier, furthermore, is formed in each of said raceways 45 with one or more sockets 46 which
 5 are vertically alignable with the openings 44 in said plates when said tool carrier is at the middle of its stroke in either direction of its movement. The raceway 43 and the raceway 45 of each adjacent pair thereof receive therebetween a plu-
 10 rality of longitudinally spaced bearing members 47 of the ball type, and each set of said bearing members is held in assembly by means of an elongated cage 48 of the plate type, one of these cage-bearing units 48—47 being arranged in run-
 15 ning fit with and between the carrier 38 and the plate 41 and the other of said units being similarly arranged between and with respect to said carrier and the plate 42. Each of the cages 48 has at least one opening 49 formed therethrough
 20 between one pair of the bearings 47 carried thereby, and these openings are so spaced from the ends of said cages as to be vertically alignable with the openings 44 in the plates 41 and
 25 42 and the sockets 46 in the carrier 38 when said cages and said carrier are at the middle of their strokes.

In view of the fact that it is intended to reciprocate the tool carrier-tool unit 38—24 at a rather high rate of speed, which is necessary for proper honing, and in order to control the move-
 30 ment of the cage-bearing units 48—47 during such reciprocation, an elongated driving link 50 is disposed in the three openings 44, 49 and 46 comprising each combination thereof, thus ef-
 35 fectuating thereby a connection between said tool carrier-tool unit, said two cage-bearing units and the two plates 41 and 42. It will be noted that the outer end of each of the links 50 resides in one of the openings 44 in one of the
 40 two plates 41 and 42, thus providing a non-rectilinearly movable, pivotal connection thereat, that the inner end of each of said links resides in one of the sockets 46 in the carrier 38, thus providing a rectilinearly movable, pivotal con-
 45 nection thereat, and that the center portion of each of said links resides in one of the openings 49 in one of the two cages 48, thus providing a pivotal connection thereat which is rectilinearly movable at half the speed and with half the am-
 50 plitude as compared with said connection at said opening 46. In other words, the cage-bearing units 48—47 are positively controlled in their movements with respect to the movement of the tool carrier 38 by means of the links 50, so that
 55 there is no possibility of said units being displaced from the positions where they are intended to and do function with the greatest possible efficiency, positions whereat said units are at all times subjected to the load there existent. Be-
 60 cause of the swinging motion of each of the links 50 about its outer end, the length of each thereof should be slightly less than the vertical distance between the opposite ends of the respective channel formed by the respective trio of open-
 65 ings 44, 49 and 46.

The front section 34 of the casing 30 is integrally formed with a hub portion 52 which is internally bored to receive an inwardly extending shaft 53, said shaft carrying a driving pulley 54
 70 on its outer end and being journaled in bearings 55 carried by said front section and the rear section 31 of said casing. The tool carrier 38 is formed with an elongated opening 58 passing transversely therethrough for receiving the shaft 53, and the length of said opening is equal

substantially to the diameter of said shaft plus the length of travel of said carrier so that said shaft does not interfere with said travel when the machine is in operation. Also, the tool carrier 38 is formed, radially outwardly of the opening 58, with a pair of diametrically oppositely spaced shoulder portions 59 between which is accommodated an anti-friction bearing unit 60 and in which unit is accommodated an eccentric portion 61 integrally formed on the shaft 53 and by means of which said carrier is reciprocated.

Means, such as a belt 64 interconnecting the pulley 54 and a motor 65, is employed for rotating the shaft 53 to reciprocate the tool carrier-tool unit 38—24.

Although the invention has been described with some detail, it is not intended that such description is to be definitive of the limits of the inventive idea. The right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claim.

What I claim is:

In a machine of the character described, a tool carrier support having a space therewithin de-

5 finned on one side by a wall, a tool carrier arranged in said space and operable for reciprocation relatively to said wall, a plate arranged between and in sliding contact with said wall and said carrier and being formed therethrough with a plurality of apertures spaced from each other in the direction of said reciprocation, grooves formed in said wall and in said carrier in opposed relation to each other and opposite said apertures and extending in the direction of said reciprocation, bearing members freely carried in said apertures and having diameters sufficient to permit occupation of said grooves by said members, and an elongated guiding member received at one of its ends in a pocket provided therefor in said carrier, at the other of its ends in a pocket provided therefor in said wall, and at a point intermediate said ends freely within an aperture provided therefor in said plate in spaced relation to each of said other apertures for preventing displacement of said carrier and said plate in their reciprocations relatively to said wall at said second-named end.

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