Nov. 27, 1934. S. EINSTEIN ET AL 1,982,287

GRINDING MACHINE

Filed May 25, 1931 3 Sheets-Sheet 1

Fig. 1

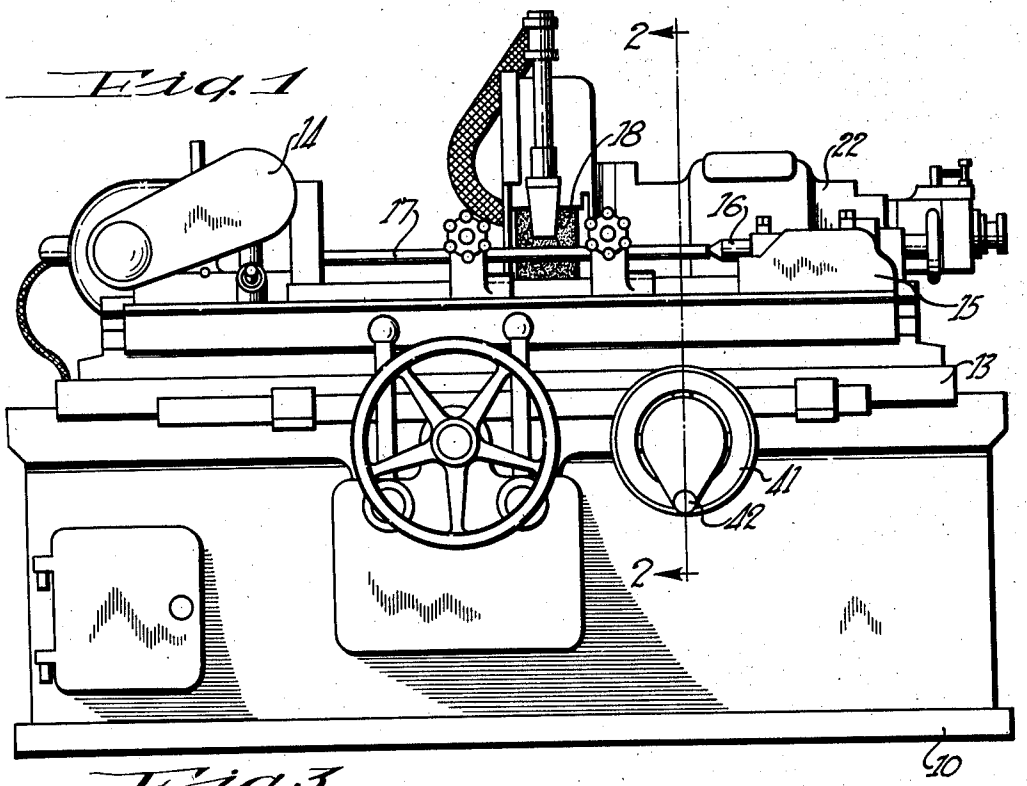
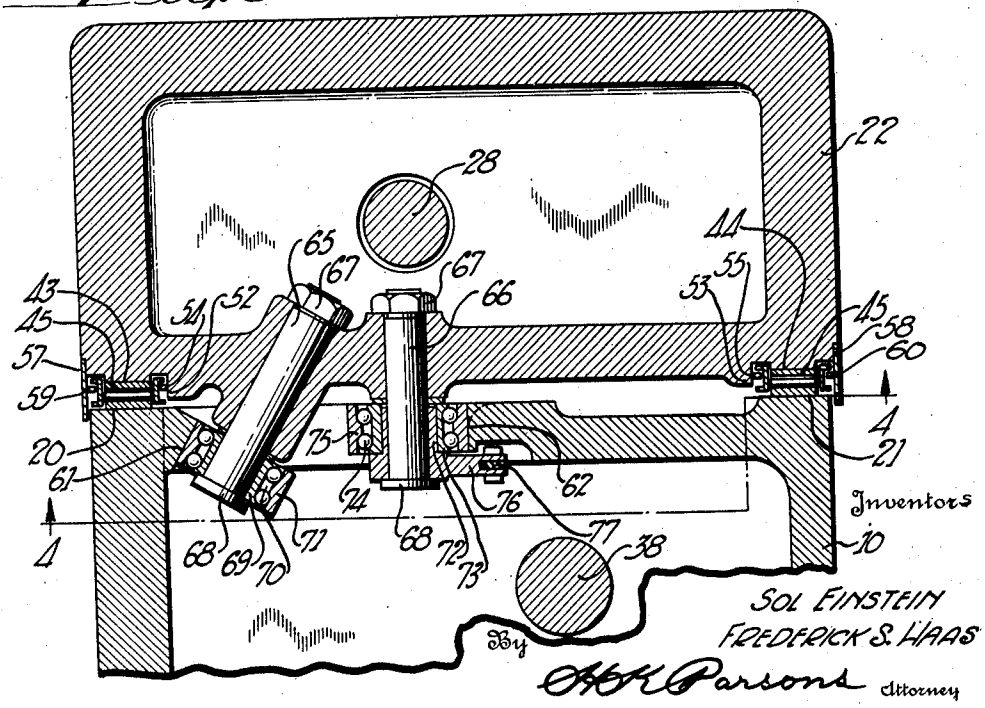



Fig. 3




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Fig. 6

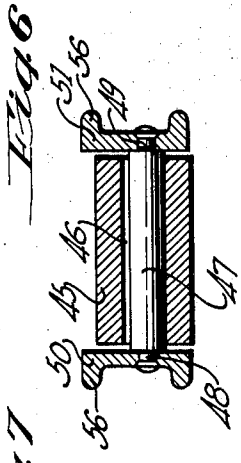


Fig. 7

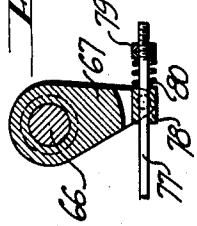


Fig. 5

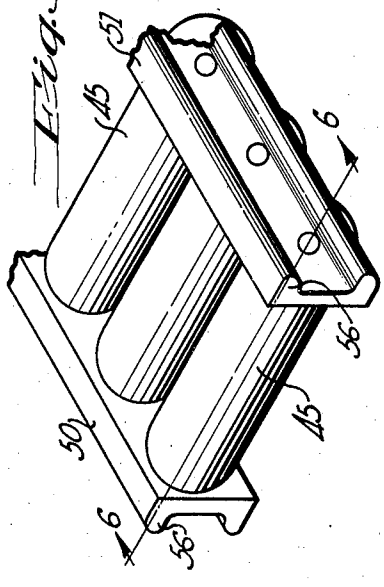
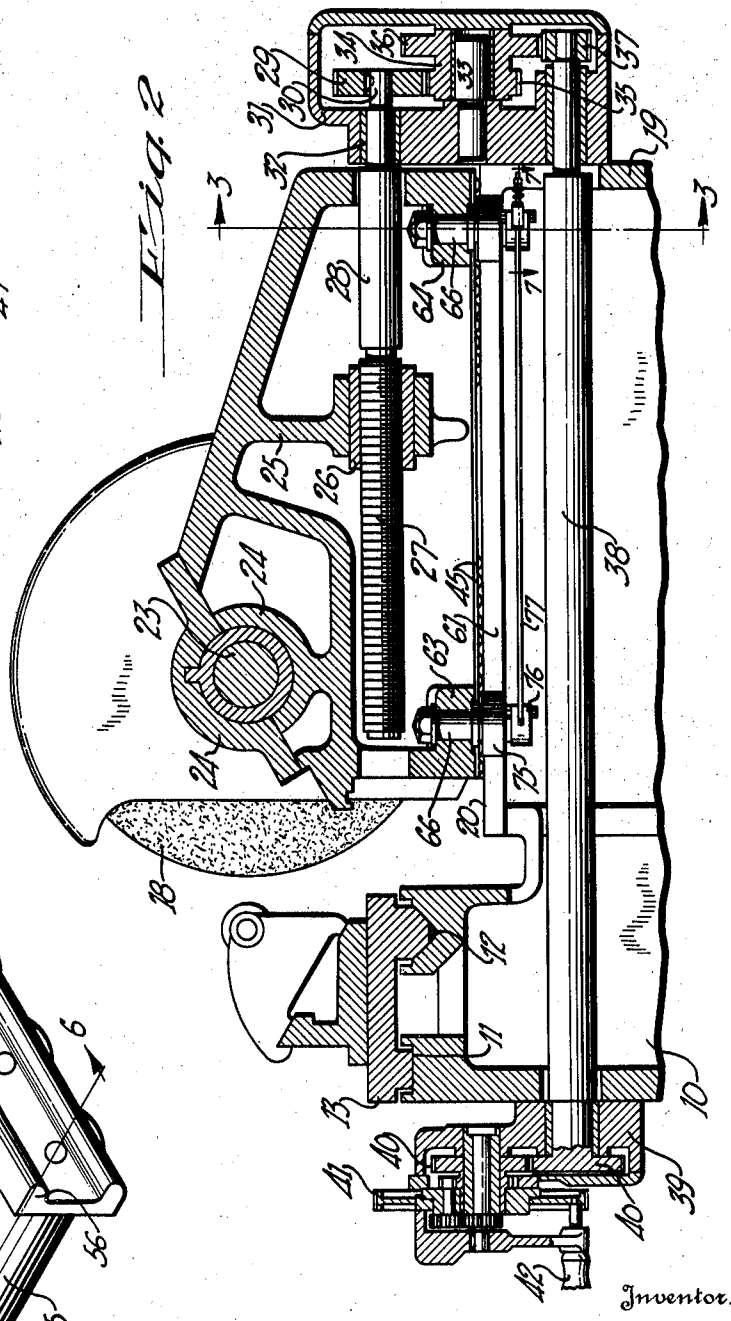


Fig. 2



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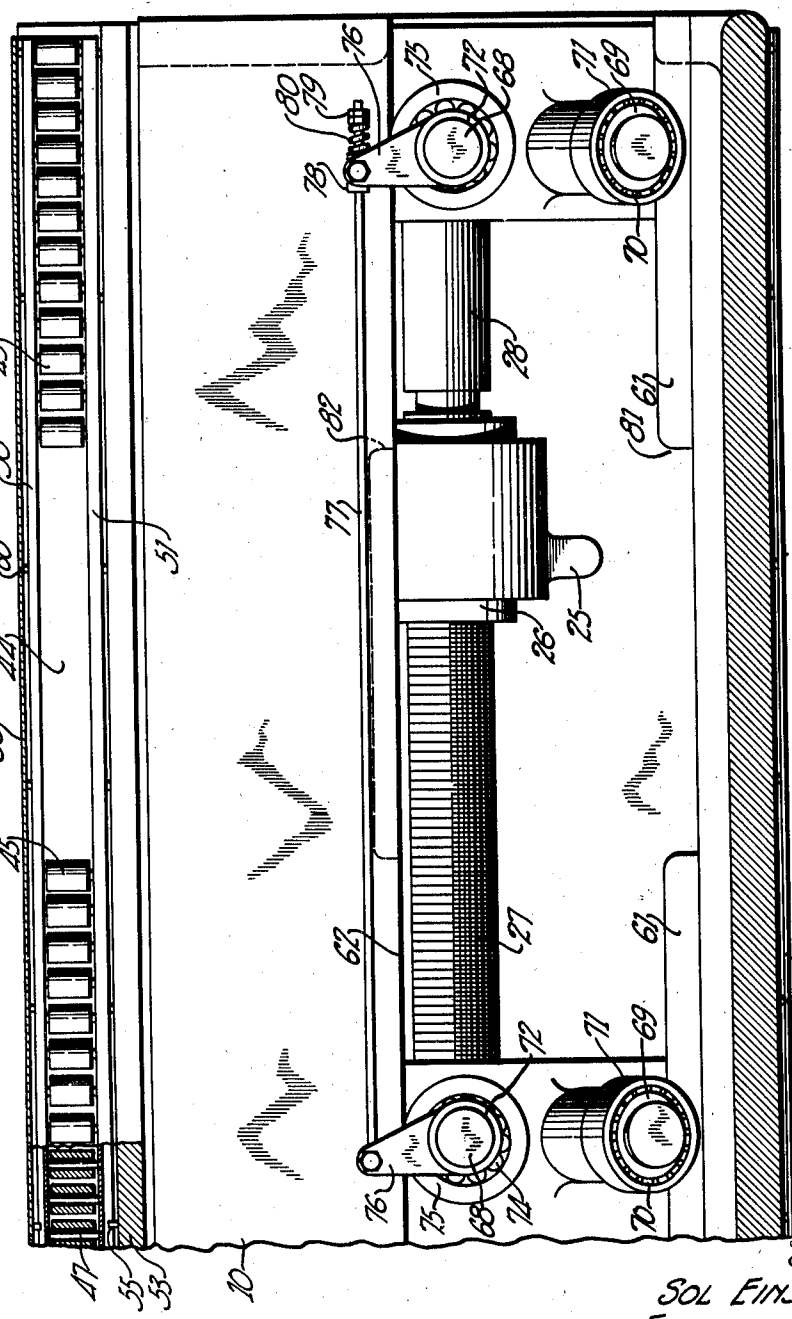


Fig. 4

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# UNITED STATES PATENT OFFICE

1,982,287

## GRINDING MACHINE

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Application May 25, 1931, Serial No. 539,750

10 Claims. (Cl. 308—6)

This invention relates to improvements in machine tool structures and especially to improvements in grinding machines.

An object of the invention is the provision of an improved bearing or support for relatively heavy shiftable units.

Another object of the invention is the provision of an improved antifriction bearing support for grinding wheel heads, whereby the friction between the sliding ways or faces of the bed or support of the machine and the wheel head proper is reduced to a minimum.

A further object of the invention is the provision of improved means for eliminating to a maximum degree the possibility of vibration of the grinding wheel head while its wheel is in operative engagement with the work, thereby reducing chatter on the work to a minimum and insuring a superior grade and finish of work.

A still further object of the invention is the provision of an improved grinding machine embodying the usual heavy wheel head together with an improved support therefor which will materially reduce both the mechanical and hand power necessary to effect the actuation thereof relative to its bed or support.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawings forming a part thereof, and it is to be understood that any modifications may be made in the exact structural details there shown and described without departing from or exceeding the spirit of the invention as defined by the appended claims.

In the drawings:

Figure 1 is a front elevation of a grinding machine embodying the improvements of this invention.

Figure 2 is a fragmentary sectional view taken on line 2—2 of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 2.

Figure 4 is a view partly in section and partly in elevation as seen from line 4—4 of Figure 3.

Figure 5 is a perspective view of a fragment of the anti-friction bearing embodied in this invention.

Figure 6 is a sectional view taken on line 6—6 of Figure 5.

Figure 7 is a fragmentary view taken on line 7—7 of Figure 2.

Throughout the several views of the drawings similar reference characters are employed to indicate the same or similar parts.

A device of this invention may comprise a bed or support 10 having formed at the upper end thereof ways 11 and 12 for guiding the carriage 13 longitudinally of the bed 10. The carriage 13 has adjustably secured thereto headstock 14 and tailstock 15 from which suitable centers as 16 project for engagement with a rotating work piece 17. The carriage 13 is reciprocated by any known means for traversing the work 17 past the active face of the grinding wheel 18.

The bed 10 is further provided with a lateral extension 19 forming ways 20 and 21 on which is supported the grinding wheel carriage 22 for movement toward the work to effect the desired feed between the work and grinding wheel. The grinding wheel 18 is secured to one end of a spindle 23 journaled in suitable bearings 24 formed integral with or secured to the carriage 22. In order to effect the feeding movement of the carriage 22 it is provided interiorly thereof with a web 25 in which is secured a nut 26 in threaded engagement with the threaded end 27 of an adjusting screw 28. Rotation is imparted to the screw 28 by a gear 29 secured to its rear end 30 which is positioned internally of a suitable guard or housing 31 which in addition forms a journal as at 32 for the screw 28. A stud 33 is carried by the housing 31 and has rotatably mounted thereon a compound gear 34 having pinion 35 which meshes with the gear 29, and a large gear 36 meshing with a second pinion 37 on the end of transverse shaft 38. The shaft 38 is journaled at one end in the bracket 31 and at the other end in a bracket or housing 39 secured to the forward face of the bed 10. The shaft 38 is rotated by the usual cross feeding mechanism which includes the gears 40 rotatably journaled on shafts carried by the housing 39, and the said gears terminate in a ratchet wheel 41 for automatically actuating the shaft by the pick-feed mechanism or manually by a hand lever 42 for manual adjustment thereof.

In the past, substantially plane metal to metal contact was had at the ways 20 and 21 between the carriage 22 and the bed 10, resulting in considerable friction and requiring considerable power to adjust the several parts. To overcome this undesirable condition there is interposed between the ways 20 and 21 of the bed and the ways 43 and 44 of the carriage 22 anti-friction rollers 45. The structure of the anti-friction bearing on each side of the carriage 22 is identical, and it is therefore deemed sufficient if but one of said bearings be described in detail. Accordingly, the rollers 45

are provided with an enlarged bore 46 through which a supporting pin 47 of a diameter less than the diameter of the bore extends. Opposite ends 48 and 49 of the pin 47 are reduced forming appropriate shoulders abutting the opposed flat faces of channel members 50 and 51. The rollers 45 are of a length slightly less than the distance between the reduced ends 48 and 49 of the pins so that the rollers are free of the channels 50 and 51 to prevent any binding thereof. As shown in Figures 2 and 4, the guide channels 50 and 51 extend substantially throughout the length of the ways 43 and 44 of the carriage 22 and have rollers intermediate them for substantially one third of the distance from their extreme ends, leaving the central third of the channels free. As is well known, given a stationary surface, a roller bearing thereon and a movable surface contacting with the upper point of the roller bearing, movement of the shiftable surface will cause the said surface or a given point thereof to advance twice the distance of advancement of the roller bearing thereagainst. Therefore, as the carriage 22 is advanced the rollers 45 and guiding channels 50 and 51 move therewith, and will advance from the position shown in Figure 2 to the forward end of the guideway 20 of the bed 10, while the guideway 43 of the carriage 22 will advance beyond the end of the guideway 20 with substantially all of the roller bearings contacting the ways 20 and 43 and 21 and 44.

Referring now to Figure 3, it will be noted that the carriage 22 adjacent the inner edges of the guideways 43 and 44 is provided with shoulders 52 and 53 from which pins 54 and 55 respectively protrude. These pins 54 and 55 are received within the channel and engage, during assembly, with the upper arm 56 of the channels. To exclude foreign materials and dirt from between the ways, the carriage 22 has secured to its outer surfaces guide plates 57 and 58 from which pins 59 and 60 protrude and are likewise received in the channel for engagement with the upper arm 56. From this it will be seen that the disassociation of the antifriction bearings and carriage is prevented once the said bearings have been mounted in position.

In order to hold vibration of the carriage 22 to a minimum, the bed extension 19 intermediate the ways 20 and 21 is provided with faces 61 and 62 at an angle to one another. The face 61 is disposed at an angle extending upwardly and outwardly as respects the vertical walls of said bed extension 19, while the face 62 is substantially parallel therewith. The carriage 22 is provided adjacent its forward and rear walls with webs or flanges 63 and 64 each supporting a pair of studs 65 and 66, the former having its axis disposed substantially parallel with the face 61, while the latter has its axis disposed perpendicularly or substantially parallel with the face 62. The studs 65 and 66 are each provided on one end with a nut 67 and on the other end with a head 68. The stud 65 has surrounding it and engaging the head 68 the inner race 69 of an antifriction bearing 70, with the outer race 71 thereof contacting with the face 61 of the bed. The stud 66 on the other hand has surrounding it an eccentric sleeve 72 on which is mounted the inner race 73 of an antifriction bearing 74 whose outer race 75 contacts with the face 62. Each eccentric sleeve 72 has extending from it an arm 76 coupled with one another by a connecting rod 77. One of said arms 76 is secured to a sleeve 78 through which the rod 77 extends. Lock nuts 79 are threadedly secured on the end of the rod 77. A spring 80 is interposed between the adjacent faces of the sleeve 78 and lock nuts 79, whereby a yielding pressure is maintained on the arms.

The eccentric sleeves, see Figure 4, are disposed at 180 degrees in advance of one another so that the equalizing pressure of the spring 80 in opposite directions tends to force the large portion of each eccentric against the face 62.

In assembly the arms 76 are actuated in the direction to cause the antifriction bearing 74 to approach the face 62 thereby tending to shift the carriage 22 laterally of the bed extension 19. This shifting of the carriage 22 through the engagement of the bearing 70 with the face 61 acts as a cam for forcing the carriage 22 into engagement with the antifriction rollers 45 and preloading and maintaining the said load on the bearings. This relative clamping or locking of the parts relative to one another reduces the vibration to a minimum and the antifriction bearings 70 and 74 together with the rolls 45 reduce the friction to a minimum.

In assembling the parts the carriage is first assembled with all of its parts, including the rollers 45 as supported by their channels 50 and 51, being held against disassociation by the pins 53, 54, 57 and 58 engaging the arms 56 of the outer channels 50 and 51. The carriage is then positioned to have the forward antifriction bearings 70 and 74 substantially midway between the length of the ways 20 and 21 where the faces 61 and 62 are respectively cut back, as shown at 81 and 82 in Figure 4. The carriage 22 is then actuated toward the front of the machine thereby causing the said bearings to properly engage their respective faces, at which time the connecting rod 77 is adjusted to properly load the carriage on the bearings. It will be understood that with the carriage in position relative to the bed extension, to have the forward bearings 70 and 74 adjacent the cut back portions 81 and 82, the rear bearings 70 and 74 will be outside said extension 19 to the rear but in alignment with the bearing faces 61 and 62 so that the actuation of the head or carriage 22 toward the front wall causes both the forward and rear bearings 70 and 74 to ride upon their proper bearing faces 61 and 62.

What is claimed is:

1. In a machine tool organization the combination of a bed having formed thereon guideways, a slide adapted to be supported by the bed for movement relative thereto on the guideways and having additional guideways opposed to the bed guideways, anti-friction roller bearings between the bed and slide guideways simultaneously contacting said ways, guide bars lying along the edges of said anti-friction rollers, spacing means carried by the guide bars for definitely spacing the rollers from one another, a flange extending outwardly from the guide bars, pins carried by the slide underlying the flanges to prevent disassociation of the rollers and slide, and yieldable means carried by the slide and co-operating with the bed for forcing the slide into engagement with the anti-friction rollers.

2. In a machine tool organization the combination of a bed, a slide mounted thereon for movement relative thereto, co-operating guideways carried by the bed and slide, and means for eliminating side play between the bed and slide and for holding the guideways to one another including a pair of surfaces disposed at an angle to one another formed on the bed beneath the slide, a pair of anti-friction bearings carried by

the slide for engaging one of said surfaces, a second pair of anti-friction bearings carried by the slide for engaging the second of said surfaces, means mounting one of said pair of bearings for approaching movement relative to its surface, and yielding means for actuating said bearings toward its surface whereby the angular relationship of said surfaces tends to force the slide onto the bed.

3. In a machine tool organization the combination of a bed, a slide on the bed for movement relative thereto, anti-friction rollers between the slide and bed, cage means for spacing the rollers relative to one another, means carried by the cage and slide co-operating with one another to prevent inadvertent disassociation of the bearing rollers and slide, additional means carried by the slide and bed tending to force the slide into engagement with the anti-friction rollers and comprising a pair of angularly disposed surfaces formed on the bed, anti-friction bearings carried by the slide for engagement with said surfaces, said bearings being mounted as respects the bed surfaces and slide for independent movement co-operating with the surfaces in pulling the slide to the bed, and yielding means for actuating the bearings relative to the bed surfaces.

4. In a mechanism for eliminating side play between a slide and its support the combination with a bed and a superimposed slide therefor, of a guiding surface disposed normal to the line of movement of the slide, a second surface opposed to the first surface in an angularly related relation, an anti-friction bearing carried by the slide for engagement with the normal face, a second anti-friction bearing carried by the slide for engagement with the angular face, means for mounting one of said bearings eccentrically to its face whereby shifting movement of the bearing eccentrically causes a lateral shifting of the slide and second bearing carried thereby which through the angularly related faces tends to cam the slide to the bed, and yielding means for actuating the bearing about its eccentric mounting.

5. In a machine tool organization the combination of a bed, a pair of plane horizontally disposed guide ways thereon, a slide associated with said bed and having formed thereon a pair of plane horizontally disposed guide ways in opposition to the guide ways of the bed, a second pair of guide ways formed on the bed intermediate the first pair of said ways, said second pair of guide ways being angularly related to one another and to the first pair of guide ways, and anti-friction means carried by the slide and co-operating with the second pair of guide ways for accurately positioning the slide and its guide ways relative to the bed and its first-named guide ways.

6. In a machine tool organization the combination of a bed, a pair of plane horizontally disposed guide ways thereon, a slide associated with said bed and having formed thereon a pair of plane horizontally disposed guide ways in opposition to the guide ways of the bed, a second pair of guide ways formed on the bed intermediate the first pair of said ways, said second pair of guide ways being angularly related to one another and to the first pair of guide ways, anti-friction means carried by the slide and co-operating with the second pair of guide ways for accurately positioning the slide and its guide ways relative to the bed and its first-named guide ways, and anti-friction bearings disposed between the plane horizontally disposed guide ways of the bed and slide.

7. In a machine tool organization the combination of a bed, a pair of spaced guide ways having a plane supporting surface extending in a substantially horizontal plane, a slide associated with said bed and having formed thereon a pair of spaced guide portions substantially co-extensive with the guide ways of the bed, a plurality of anti-friction rollers between the bed and slide guide ways for supporting the said slide during its movement, a second pair of spaced guide ways formed on the bed and disposed between the said first pair of guide ways, said second pair of guide ways being angularly disposed to one another and to the opposed ways of the bed and slide, and means carried by the slide co-operating with the second pair of guide ways for controlling the lateral position of the slide with respect to the bed and for holding the slide on the supporting anti-friction bearings.

8. In a machine tool organization the combination of a bed, a pair of spaced guide ways having a plane supporting surface extending in a substantially horizontal plane, a slide associated with said bed and having formed thereon a pair of spaced guide portions substantially co-extensive with the guide ways of the bed, a plurality of anti-friction rollers between the bed and slide guide ways for supporting the said slide during its movement, a second pair of spaced guide ways formed on the bed and disposed between the said first pair of guide ways, said second pair of guide ways being angularly disposed to one another and to the opposed ways of the bed and slide, means carried by the slide cooperating with the second pair of guide ways for controlling the lateral position of the slide with respect to the bed and for holding the slide on the supporting anti-friction bearings, and means associated with the supporting bearing rollers for properly positioning same with respect to the opposed guide ways of the bed and slide.

9. In a machine tool organization the combination of a bed, a pair of spaced guide ways having a plane supporting surface extending in a substantially horizontal plane, a slide associated with said bed and having formed thereon a pair of spaced guide portions substantially co-extensive with the guide ways of the bed, a plurality of anti-friction rollers between the bed and slide guide ways for supporting the said slide during its movement, a second pair of spaced guide ways formed on the bed and disposed between the said first pair of guide ways, said second pair of guide ways being angularly disposed to one another and to the opposed ways of the bed and slide, means carried by the slide cooperating with the second pair of guide ways for controlling the lateral position of the slide with respect to the bed and for holding the slide on the supporting anti-friction bearings, comprising a follower for each of said second pair of guide ways, and yielding means for maintaining contact between the followers and their guide ways.

10. In a machine tool organization the combination of a bed, a pair of spaced guide ways having a plane supporting surface extending in a substantially horizontal plane, a slide associated with said bed and having formed thereon a pair of spaced guide portions substantially co-extensive with the guide ways of the bed, a plurality of anti-friction rollers between the bed and slide guide ways for supporting the said slide during its movement, a second pair of spaced guide ways formed on the bed and disposed between the said first pair of guide ways, said second pair of guide ways being angularly disposed to one another

and to the opposed ways of the bed and slide, means carried by the slide cooperating with the second pair of guide ways for controlling the lateral position of the slide with respect to the bed and for holding the slide on the supporting anti-friction bearings, means spacing the supporting anti-friction rollers from one another to permit free rolling of the said bearings during relative movement of the slide and bed, and cooperating means associated with the bearing roller spacing means and slide to prevent inadvertent disassociation of the roller bearings and slide.

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