This invention relates generally to machine tools of the type having a driving spindle mounted on a boom which, in turn, is supported on the frame of the machine for movement to different positions and thereby rendering it possible to convert the machine to either a drill press, a rotary saw, a sander, or lathes of different sizes. 

In one embodiment of this invention to provide an improved mounting for the boom on the machine frame enabling sliding movement of the boom in the direction of its axis to different positions relative to the machine frame and rendering it possible to swing the boom to either a horizontal position, a vertical position, or to intermediate angular positions, depending on the type of work to be performed.

It is another object of this invention to provide means for feeding the boom in the direction of its axis relative to the machine frame. In the specific embodiment of the invention selected herein for the purpose of illustration, the boom is urged in a downward direction relative to the machine frame by the force of gravity when in an upright position and the lower end of the boom is held against downward movement by a stop which is supported on the machine frame for vertical adjustment to enable feeding the boom in either direction along its axis when the boom is in an upright position.

It is still another object of this invention to provide readily operable control means supported on the machine frame for convenient manipulation and connected to the stop for raising and lowering the latter.

It is a further object of this invention to provide independently operable latching devices conveniently located for manipulation to respectively hold the boom against sliding movement from any preselected adjusted position and for holding the boom against swinging movement from any desired angular position with respect to the machine frame.

It is a still further object of this invention to provide means responsive to swinging movement of the boom to an upright position for releasably holding said boom in the latter position.

The foregoing as well as other objects will be made more apparent as this description proceeds especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a fragmentary sectional view of a machine tool embodying the features of this invention;

Figure 2 is a fragmentary side elevational view of a part of the machine shown in Figure 1;

Figures 3, 4, 5, 6 and 7 are respectively sectional views taken on the lines 3—3, 4—4, 5—5, 6—6 and 7—7 of Figure 1;

Figures 8 and 9 are respectively cross sectional views taken on the lines 8—8 and 9—9 of Figure 7; and

Figure 10 is a perspective view of a typical machine tool in connection with which the present invention may be successfully used.

The machine tool selected for the purpose of illustrating the present invention is shown in Figure 10 of the drawings and is indicated generally by the reference numeral 11. The machine tool 11 comprises suitable frame structure 12 having upright members 13 in the form of angle bars and having a plate 14 suitably secured to the upper ends of the members 13. The upright members 13 are arranged with respect to one another to provide support engaging legs for the machine and the plate 14 serves as a working surface.

As seen in Figure 10, the upper end portions of the members 13 at one side of the frame 12 are connected together by a plate 15 which serves as one side wall of the frame, and the members 13 at the opposite side of the frame are connected together by a plate 16 which forms the other side of the machine frame. The lower ends of the upright members 13 are brazed or connected together by a plate 17 which forms a platform at the bottom of the frame 12. If desired, a second platform 18 in the form of a plate may be provided intermediate the top plate 14 and the base plate or platform 17. The plate 18 extends between the side walls or plates 15 and 16 and terminates short of the rear side of the frame in order to accommodate certain of the machine parts to be presently described.

Referring again to Figure 10 of the drawings, it will be noted that the machine tool 11 has a power head 19 which is secured to one end of a supporting element in the form of a tubular boom 20 of some considerable length. In Figure 10 of the drawings, the boom 20 is shown as supported in a vertical position and the power head 19 is secured to the upper end of the boom. The power head 19 comprises a support 21, a spindle 22, and an electric motor 23. The spindle 22 is mounted on the support 21 for rotation about an axis extending parallel to the axis of the boom 20 and provision is made at the inner end of the spindle for supporting either a tool or a work piece, depending on the type of work to be performed. In any case, the motor 23 is mounted on the support 21 and is connected to the outer end of the spindle 22 by a belt 24 which serves to drive the spindle 22.

In accordance with the present invention, the boom 20 may be swung from the horizontal position thereof shown in Figure 1 of the drawings to the vertical position shown in Figure 10 and may also be positioned in any selected angular position with respect to the machine frame 12.

In addition, the boom 20 may be adjusted relative to the frame structure 12 in the direction of the axis of the boom and this adjustment may be accomplished in any of the various angular positions of the boom 20 relative to the frame 12. The above adjustments of the boom 20 are desired in order to locate the power head in the various positions required to enable converting the machine to either a drill press, a rotary saw, a sander, or lathes of different sizes. It will be noted that when the boom 20 is in its horizontal position with respect to the frame 12, it extends below the top plate 14 so that the latter provides an unobstructed working surface. It will further be noted from Figure 7 of the drawings that the top plate 14 is slotted at 26 to provide clearance for the boom 20 when the latter is in its vertical or upright position.

The boom 20 is mounted on the underside of the top plate 14 by a bracket 27 having axially spaced aligned bearing portions 28 and 29 connected together at diametrically opposite sides by bars 30 (Figs. 4 and 7). As shown in Figure 4 of the drawings, the bearing portion 28 of the bracket 27 is fashioned with tubular portions or projections 31 which extend laterally from diametrically opposite sides of the bearing portion 28. The tubular projections 31 are in axial alignment and the common axis thereof extends horizontally at right angles to the axis of the boom 20 in intersecting relationship thereon. Suitable shafts 32 are respectively secured within the tubular projections 31 by set screws 33 and the outer
ends of the shafts 32 project beyond the corresponding ends of the projections 31. The extremities of the shafts 32 are respectively journalled in bearings 34 and the latter are secured by studs 35 to suitable bosses 36 which project downwardly from the underside of the plate 44 at opposite sides of the slot 26 in the plate 14. It follows from the foregoing hint that the end of the shafts 32 may be swung between the horizontal position thereof shown in Figure 1 and the vertical position shown in Figure 7. Inasmuch as the boom 20 is supported by the bearing portions 28 and 29 on the bracket, it also follows that the boom swings as a unit with the bracket 27. The stud 39 is located in its horizontal position shown in Figure 1 by an adjustable stop 37 comprising a projection 38 extending laterally outwardly from the bearing portion 29 on the bracket 27, and a stud 39. The stud 39 is threadably supported in a boss 40 depending from the underside of the plate 14 and has a head portion at the lower end for engagement with the top surface of the projection 38. As a result of this construction, accurate location of the boom 20 in its horizontal position may be accomplished by adjusting the stud 39 relative to the projection 38. The stud is held in any desired adjustment position by a lock nut 41 threaded on the stud 39 in a position to engage the bottom surface of the boss 40.

The bracket 27 is capable of being firmly held in any desired angular position with respect to the frame structure 12 by a latching device 42. As shown in Figure 6 of the drawings, the latching device 42 comprises a rod 43 having its axis extending at right angles to the axis of the boom and having the inner end projecting through a bore 44 formed in the bearing portion 29 of the bracket 27 below the boom 20. The inner end of the rod 43 is threaded for engagement by a clamping nut 45 and the outer end of the rod 43 projects through a slot 46 formed in the side plate 16 on the frame structure 12. An enlargement 47 is formed on the rod 43 and extends from the inner surface of the wall 16 to the outer surface of the bracket 27. The outer end of the rod 43 is threaded for engagement by a clamping nut 45 having a flange 49 at the inner end arranged in bearing engagement with the outer surface of the plate 16. As shown in Figure 2 of the drawings, the slot 46 is concentrically arranged with respect to the axis of pivotal movement of the bracket 27 and is of sufficient length to permit swinging movement of the bracket 27 from its horizontal position shown in Figure 1 to its vertical position shown in Figure 7. It will of course be understood that the bracket as well as the boom 20 may be clamped in any selected angular position by merely tightening the nut 48 on the outer end of the rod 43 and this may be accomplished by a socket wrench indicated in Figure 4 of the drawings by the numeral 50.

The bracket 27 and the boom 20 are accurately located in a vertical position by a stop 51 suitably mounted on the frame structure 12 of the machine in a position to engage the rod 43 when the bracket is swung to its vertical position shown in dotted lines in Figure 2 of the drawings. The bracket 27 or rod 43 is held in abutting engagement with the stop 51 by an arm 52 which extends generally horizontally and is pivoted to the machine frame 12 by a pin 53. The pin 53 engages the arm 52 intermediate the ends thereof and the axis of the pin 53 extends substantially parallel to the axis of pivotal movement of the bracket 27 in order to permit swinging movement of the arm 52 in a vertical plane. The outer end of the arm 52 is connected to one end of a spring 54 having the opposite end anchored to the frame structure 12 of the machine tool. Thus, the inner end of the arm 52 projects in an upward direction. The inner end of the arm 52 projects into the path of travel of the enlargement 47 on the rod 43 and is engaged by the enlargement upon swinging the bracket 27 to its vertical position. Thus, the inner end of the arm 52 is swung downwardly by the bracket 27 as the latter approaches its vertical position indicated by the broken lines in Figure 1 of the drawings. The inner end of the arm 52 has a cam face 55 which engages the enlargement 47 in opposed relationship to the stop 51 that the bracket 27 may retain the enlargement 47 in abutting engagement with the stop 51. Thus, the arm 52 acts as an automatic lock for holding the boom 20 in its vertical position with respect to the frame structure 12.

The boom 20 is slidable relative to the bracket 27 in the directions of its axis and when in its vertical position is urged by the force of gravity in a downward direction against a stop 56. The stop 56 has a horizontal part 57 positioned for engagement by the lower end of the boom 20 and has a tubular portion 58. The tubular portion 58 has its axis extending vertically and is internally threaded for threadably engaging a vertically extending feed screw 59. The lower end of the feed screw 59 is journaled in a bearing 60 and the latter in turn is secured to the plate 17 at the bottom of the frame structure 12. The upper end of the feed screw 59 is journaled in a bracket 61 which, in turn, is mounted on a vertical guide rod 62 extending in parallel relationship to the feed screw 59. The lower end of the guide rod is secured to the plate 17 by clamping nuts 62 and the upper end of the guide rod is suitably fastened to the top plate 14 of the frame structure 12.

As shown in Figure 9 of the drawings, the tubular portion 58 of the stop 56 has an arm 63 projecting laterally from the upper end thereof and the free end of the arm is formed with a slot 64 for receiving the guide rod 62. Thus, rotation of the stop with the feed screw 59 is prevented by the guide rod 62, and rotation of the feed screw 59 is prevented by the arm 63. In addition, the inner end 67 of the rod 62 is secured to the stop 56. Raising of the stop 56 by the screw 59 feeds the boom 20 in an upward direction and since the boom is held by the action of gravity in contact with the stop 56, it follows that lowering of the stop 56 by the screw 59 feeds the boom 20 in a downward direction.

The feed screw 59 is rotated from a position at the front side of the wall 15 by a crank 65. The crank 65 is secured to the outer end of a shaft 66 and the inner end of the shaft is journaled on a depending arm 67 of the bracket 61. A bevelled pinion 68 is secured to the shaft 66 at the inner end of the arm 67 and a collar 69 is secured to the shaft 66 at the outer side of the bracket arm 67. The bevelled pinion 68 meshes with a bevelled pinion 70 which is secured to the upper end of the feed screw 59 so that rotation of the crank 65 imparts a rotative movement to the screw 59.

In accordance with the present invention, the boom 20 may be locked against sliding movement relative to the bracket 27 and, for accomplishing this result, a latching device 71 is provided. As shown in Figure 5 of the drawings, the latching device 71 has a bolt in the form of a rod 72 which extends at right angles to the axis of the boom 20. The inner end 73 of the bolt or rod 72 is enlarged in diameter and slidably engages in axially aligned bores 74 respectively formed in the bars 30 of the bracket 27 below the boom 20. The side of the enlarged end 73 of the bolt is fashioned with an arcuate recess 75 and this recess is of sufficient radius to freely receive the adjacent portion of the bar 30 of the bolt 72 projects through a slot 77 formed in the plate 16 on the frame structure 12 and is threaded for engagement by a clamping nut 78. The clamping nut 78 engages the outer end of a tubular spacer 79 which is sleeved on the end 76 of the bolt 72 and engages at the rear end a washer 80. The washer 80 is mounted on the outer end portion 76 of the bolt 72 and is of sufficient diameter to engage the adjacent side of the bracket 27.

With the above construction, it will be noted that
5 tightening of the clamping nut 78 on the bolt 72 shifts the bolt 72 in an outward direction to wedge the inner end portion 81 of the recess 75 against the adjacent surface of the boom 20 and thereby frictionally holds the boom 20 against axial displacement relative to the bracket 27. In order to insure releasing the bolt 72 from wedging engagement with the boom 20 upon loosening the clamping nut 78, a spring 82 is provided. The spring 82 is in the form of a bowed spring-metal disc having the central portion secured to the inner end of the bolt 72 by a screw 83 and having the peripheral edge abutting the adjacent side of the bracket 27, as shown in Figure 5 of the drawings. The arrangement is such that the spring 82, in tightening the nut, and sliding means acting on the bolt for moving said bolt to its released position relative to the boom upon loosening said nut.

6. In a machine tool, a frame structure, a boom having tool actuating means supported thereon adjacent one end thereof, means mounting the boom on the frame structure for swinging movement about an axis extending perpendicular to the longitudinal axis of the boom between positions wherein the axis of the boom extends generally horizontally and generally vertically with respect to the frame structure, an arm pivoted intermediate the ends thereof on the frame structure for swinging movement about an axis extending parallel to the axis of swinging movement of said boom, said arm being pivotally connected to a position wherein the axis of said arm extends vertically and mounted on said bracket to one side of the boom for sliding movement in directions perpendicular to the boom axis, said bolt having a recess intermediate the ends for freely receiving a portion of the boom, a clamping nut threaded on the bolt and cooperating with the bracket to wedge one side of the recess against the boom upon tightening the nut, and spring means acting on the bolt for moving said bolt to its released position relative to the boom upon loosenning the nut.
9. In a machine tool, a frame structure, a boom having a tool actuating means supported thereon adjacent one end thereof, means mounting said boom on the frame structure, said mounting means including a bracket carried by the frame structure and slidably supporting said boom for movement in the direction of its longitudinal axis, releasable means for holding said boom against axial movement relative to said bracket, said releasable means including a bolt in the form of a rod having its axis extending perpendicular to the longitudinal axis of the boom and mounted on said bracket to one side of the boom for sliding movement in directions perpendicular to the longitudinal axis of the boom, said bolt having a recess intermediate the ends for freely receiving a portion of said bolt, and a clamping nut threaded on said bolt and cooperating with said bracket to wedge one side of the recess against the boom upon tightening the nut.

10. In a machine tool, a frame structure, a boom having a tool actuating means supported thereon adjacent one end thereof, means mounting said boom on the frame structure, said mounting means including a bracket carried by the frame structure and slidably supporting said boom for movement in the direction of its longitudinal axis, releasable means for holding said boom against axial movement relative to said bracket, said releasable means including a bolt in the form of a rod having its axis extending perpendicular to the longitudinal axis of the boom and mounted on said bracket to one side of the boom for sliding movement in directions perpendicular to the longitudinal axis of the boom, said bolt having a part frictionally engageable with said boom, a clamping nut threaded on said bolt and cooperating with the bracket to press said part against said boom upon tightening the nut and spring means acting on the bolt for moving said bolt to its released position relative to the boom upon loosening the nut.

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