July 7, 1964 G. V. HULTGREN 3,139,706

ROLL GRINDER HAVING LOADING AND UNLOADING ROLL-CONVEYING MEANS

Filed March 26, 1963 3 Sheets-Sheet 1

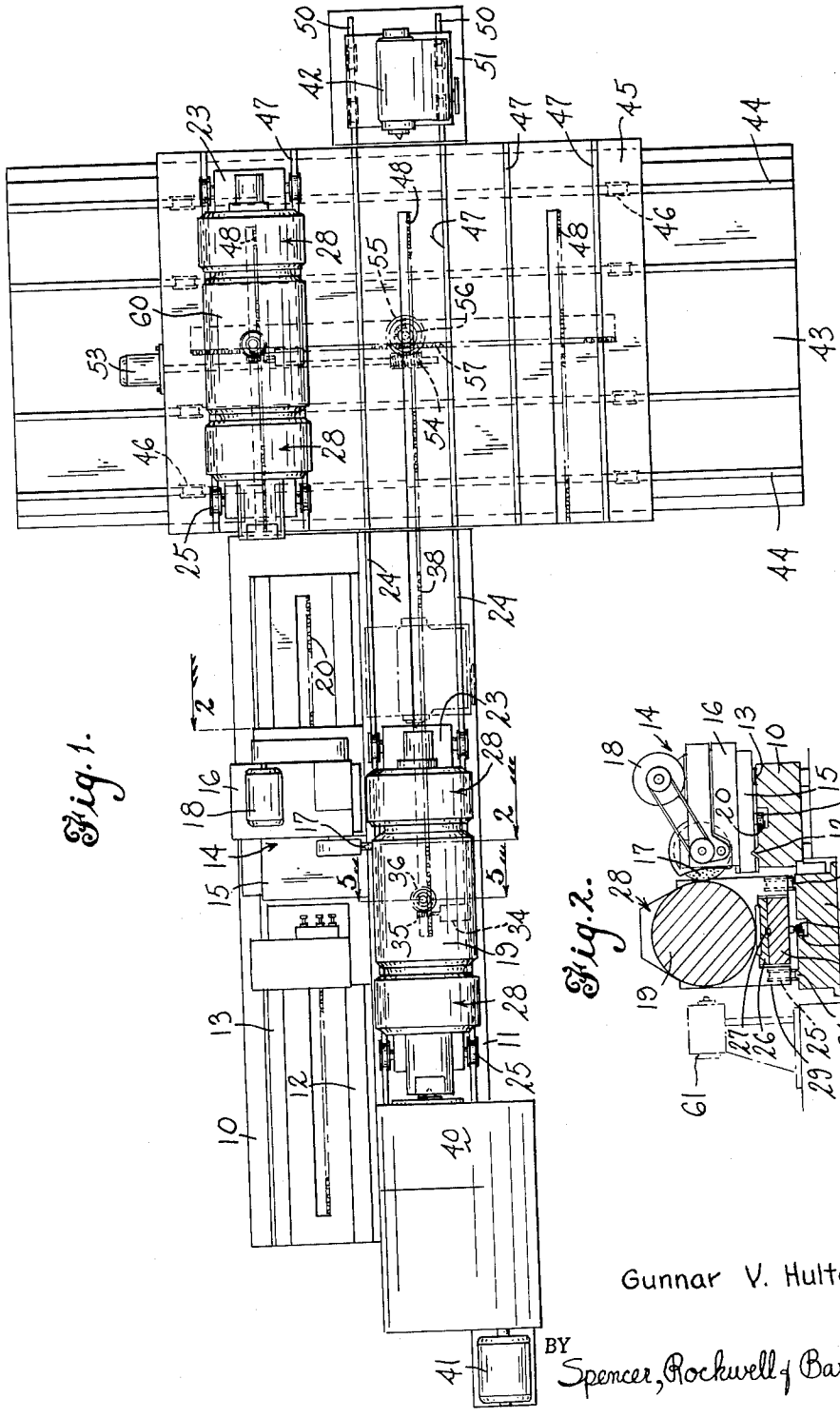


Fig. 1.

Fig. 2.

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Fig. 3.

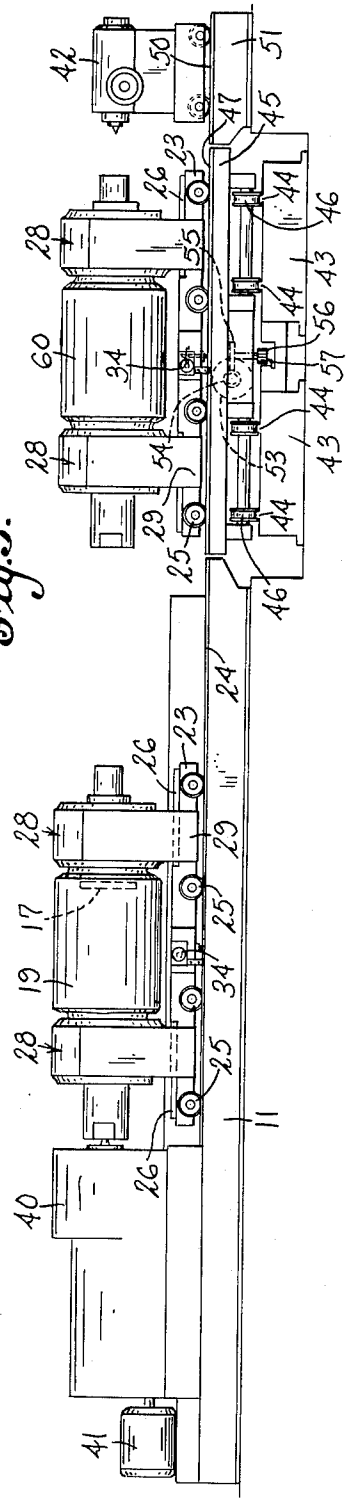
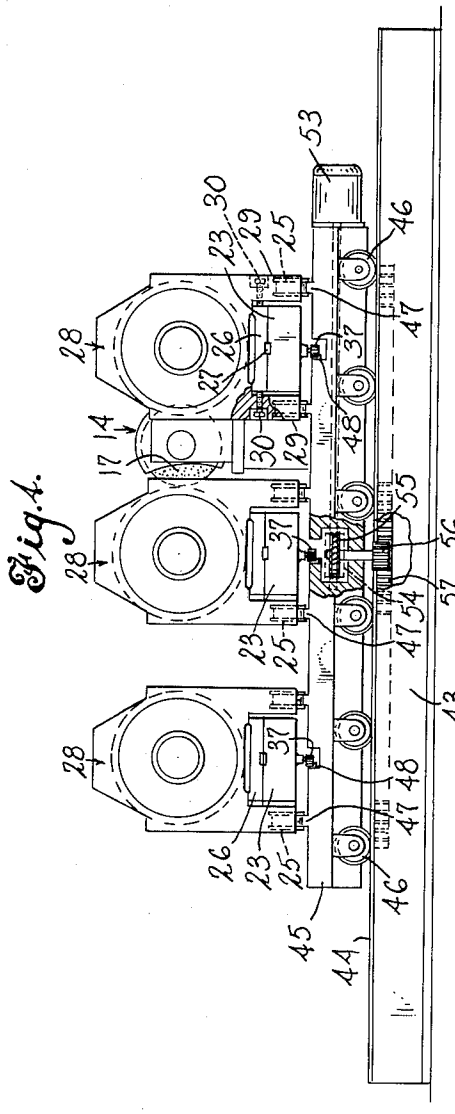


Fig. 4.



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Fig.5.

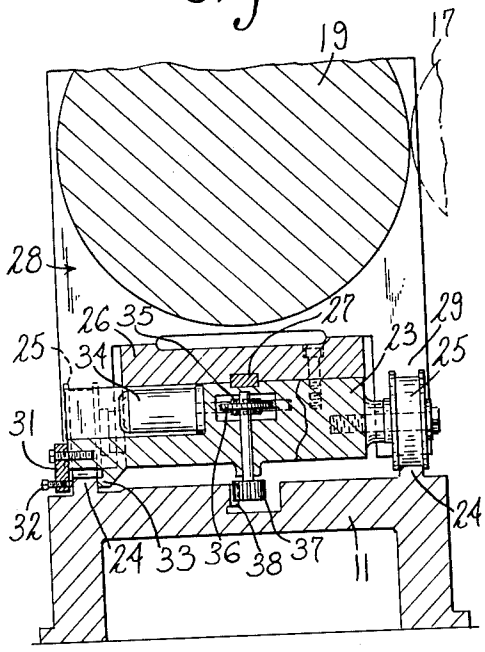


Fig.6.

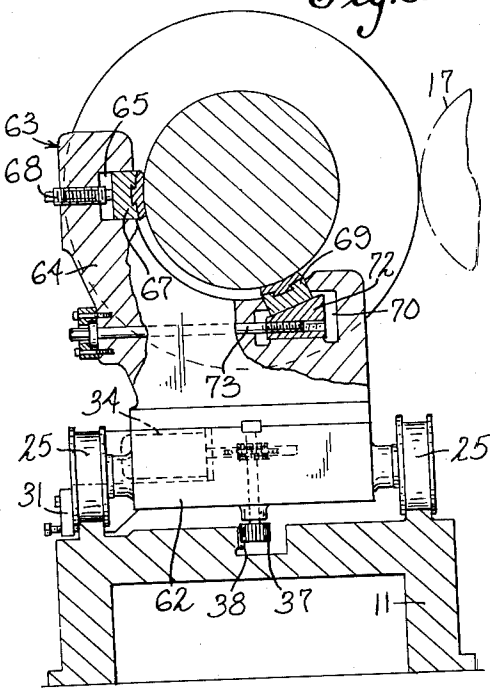
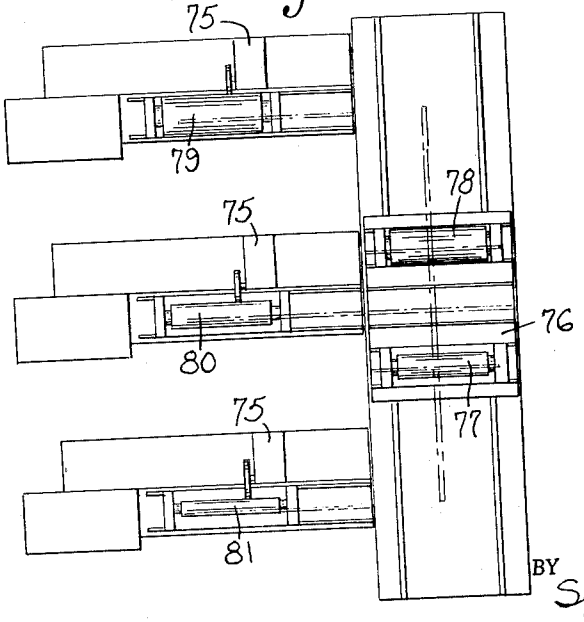


Fig.7.



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ROLL GRINDER HAVING LOADING AND UNLOADING ROLL-CONVEYING MEANS

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10 Claims. (Cl. 51—49)

This invention relates to a roll grinder and relates more particularly to a roll grinder having loading and unloading roll-conveying means.

It is well known that rolls employed, for example, in mills for cold and hot rolling of metals require resurfacing periodically by grinding operations due to the fact that the surfaces of these rolls deteriorate from continued use. The working surface of a mill roll may become worn or may be affected adversely by the high temperature of the material being worked. Mill rolls are preferably constructed so that they may be reground or resurfaced many times to extend the service life of the roll. A single mill may employ four rolls.

The rolls of a mill may be massive and extremely heavy, and for this reason may be difficult to transport from place to place for resurfacing. A grinder for refinishing a mill roll may be 40 feet in length, for example, and also, by way of example, a roll to be reground may have a working face 80 inches in length and a diameter in this area of 60 inches.

Heretofore a crane was found to be necessary for the placement of a roll directly in the grinding machine. The operator employed slings with which to support the roll from the crane, and the roll was lowered as carefully as possible into the machine for regrinding. This was a time-consuming operation especially in roll-grinding shops employing a number of grinding machines serviced by a single crane. Many times an operator would have to wait for the services of the crane, and this was inefficient particularly as the length of time required to grind a roll after it had been placed on a machine might be relatively short, say 15 minutes. Furthermore, once the services of a crane operator have been obtained, it took considerable time to place slings around a reground roll in a machine and remove this roll to a place of temporary storage, remove the slings, place the slings around another roll to be reground, lift this roll into the machine, and then remove the slings.

Another problem was commonly found in employing cranes to place rolls directly into grinding machines. Today's grinding machines are commonly much more complex than the grinding machines of only a few years ago. Many are automated and equipped with very sensitive and delicate electrical devices such as devices for probing the working face of a roll. It was found that many times when a crane was employed to lift a roll directly into such a machine, the roll would bump the machine, causing damage to the latter.

One object of the invention is to provide in a roll grinder improved means for loading and unloading rolls from the grinder.

Another object is to provide means for the faster delivery of rolls to and from a grinding machine.

Still another object is to provide in such a machine improved means to guide a roll delivered to or from the machine to prevent the roll from striking the machine and causing damage to the latter.

Another object is to provide a roll-grinding machine having loading and unloading roll-conveying means comprising a plurality of roll-supporting carriages.

In the drawings:

FIG. 1 is a top plan view of a roll grinder embodying the invention;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is an elevational view of the grinder looking toward the front thereof;

FIG. 4 is an elevational view showing the right end of the machine as viewed in FIG. 3, the tail stock being omitted, the view being partially in section;

FIG. 5 is an enlarged view similar to FIG. 2;

FIG. 6 is a view similar to FIG. 5 showing a modification of the machine; and

FIG. 7 is a top plan view showing a further modification of the machine, the view being generally diagrammatic in character.

In the form shown in FIGS. 1 through 5 of the drawings there is illustrated a grinding machine having a horizontally extending bed part **10** and a horizontally extending bed part **11** somewhat lower than the bed part **10** and arranged in parallel relation thereto as shown in FIGS. 1 and 2. The bed part **10** is provided with guide means or ways **12** and **13** arranged in parallelism upon which the grinding wheel head assembly, indicated generally at **14**, is reciprocated during a grinding operation.

The construction and operation of the grinding wheel head assembly may be that shown and described in U.S. Patent No. 2,814,914, issued December 3, 1957, and need not be described in detail here. It is sufficient for present purposes that the grinding wheel head assembly consist of a base part **15** mounted on the ways **12**, **13** for reciprocation thereon, and that this base part mounts a subbase **16** supporting the grinding wheel **17** driven by motor **18** through suitable driving connections, the subbase **16** being slidable transversely of the ways **12** and **13** to move the grinding wheel toward and away from the workpiece indicated generally at **19**.

The subbase may be driven by any conventional means. The grinding wheel head assembly may be reciprocated in the ways **12**, **13** through a rack **20** in fixed relation with the bed part **10** and cooperating with a motor-driven pinion **22** on the wheel assembly **14**. It will be understood that during a grinding operation the grinding wheel **17** is moved in the direction of the workpiece **19** to the extent necessary to produce the desired pressure of the grinding wheel on the workpiece. The wheel head assembly is reciprocated in the manner previously described to bring the grinding wheel into contact with the portion of the workpiece which is to be ground.

The workpiece is rotated during the infeed of the wheel head assembly and the reciprocation thereof along the portion of the workpiece being ground. The manner of rotating the workpiece will appear hereinafter. As previously indicated, the illustrated grinding machine is adapted to grind mill rolls, and the workpiece **19** is illustrated as such a roll supported from the bed part **11** of the grinding machine through its journals of reduced diameter.

For the purpose of supporting the roll from the bed part **11** during a grinding operation, a carriage, one of a number of carriages **23**, is provided. The carriage is moved onto the bed part **11** of the grinding machine on guides **24** which in the illustrated embodiment take the form of two tracks arranged in parallelism and cooperating with wheels **25** mounted on the carriage. The car-

riage 23 may be provided on the top thereof with filler blocks 26, each keyed thereto as at 27. The blocks 26 serve the function of raising the roll to the proper height for registration with the grinding wheel 17.

In the form of the invention presently being described, each block 26 supports on the top thereof one of the two journal boxes 28 supporting the corresponding roll journal. The aforementioned journal boxes are the same bearing mountings used to support the roll in the mill. Each journal box has a forked portion 29 embracing the corresponding filler block and a portion of the carriage as best shown in FIG. 4. Each leg of the forked portion is provided with a tapped horizontally extending hole receiving a threaded adjusting member 30 bearing on (FIG. 4) the fiiller block. The members 30 provide means for inhibiting dislocation of the journal boxes on the carriage and means to align these boxes so that the axis of the roll supported by the boxes approaches as close as possible parallelism with the path on which the grinding wheel head assembly 14 reciprocates to cover the area of the roll which requires grinding.

To further facilitate alignment of the roll axis with the last-mentioned path of the grinding wheel head assembly, the carriage 23 is provided with a downwardly extending flange 31 (see FIG. 5) overlapping one rail 24. The flange 31 has one or more threaded adjusting members, one being shown in FIG. 5 and indicated at 32, threaded horizontally through the flange to engage the near rail of the bed part 11. The carriage 23 at the under side thereof is provided with a depending shoulder 33 which may be drawn into engagement with the last-mentioned rail by the clamping action of the adjusting member 32.

It will be manifest from the foregoing that the member 32 tends to maintain the carriage in parallelism with the last-mentioned path of the grinding wheel head assembly and serves to also prevent dislocation of the carriage lengthwise of the tracks 24 after the carriage has been properly positioned on these tracks with reference to the grinding wheel head assembly.

The carriage 23 may be moved along the tracks 24 and positioned with reference to the grinding wheel head assembly by an electric motor 34 mounted on the carriage having suitable, flexible electrical connections to a source of current and driving a worm 35 meshing with a worm wheel 36 driving a pinion 37 meshing with a rack 38 in fixed relation to the bed part 11. The motor 34, which is of the reversible type, also serves to drive the carriage 23 on other guide means or tracks as will appear hereinafter.

The grinding machine of the invention is provided with the usual head stock 40 to be releasably coupled to and drivingly engage the near end of the workpiece 19 as indicated in FIG. 1, the head stock being powered in the usual manner as by an electric motor 41 having conventional means of connection to a source of current. If desired, a tail stock 42 may be provided so that the head stock and tail stock together may support the roll in the grinding machine on centers during a grinding operation. The tail stock 42 may also be provided with suitable wheels so that it may travel on the tracks 24 either to the operative position thereof shown in broken lines in FIG. 1 or to a position where it is removed from the workpiece and stored in an out-of-the-way location.

The grinding machine is provided with a further bed part 43 at one end of and on a lower level than the bed part 11, the bed part 43 extending transversely of the bed part 11 and having thereon two sets of parallel spaced guides or tracks 44, extending in a direction transversely of the tracks 24 as shown in FIG. 1. The number of tracks 44 is not critical but all of these tracks together support a rather broad main carriage 45 having wheels 46 engaging the last-mentioned tracks. Hence the carriage 45 is mounted for rolling movement transversely of the tracks 24.

A plurality of pairs of guides or tracks 47 are provided on the top of the main carriage 45 extending transversely of the tracks 44, the pairs of tracks 47 being arranged in parallel spaced relation to one another as best shown in the last-mentioned view. The arrangement is such that any pair of tracks 47 may be aligned with the pair of tracks 24 for the delivery of a workpiece-holding carriage 23 from the main carriage to the tracks 24 for the purpose of conveying a roll to be ground to a proper position in relation to the grinding wheel head assembly. The roll, after it has been ground by the machine, is conveyed by the carriage back to the main carriage for removal from the latter by a crane or the like, all as will appear more fully hereinafter. It will be noted that there are three pair of tracks 47 on the illustrated main carriage for the reception of a corresponding number of workpiece carriages.

As shown in FIG. 1, the main carriage 45 has fixed to the top thereof a plurality of racks 48 similar to the previously described rack 38 and corresponding in number to the number of pairs of tracks 47 provided on the main carriage, the racks 48 being located between the tracks of each pair. When a pair of tracks 47 is aligned with the tracks 24, the motor 34 of the carriage may be operated to drive the carriage either onto the tracks 24 from the main carriage or to drive the carriage in the opposite direction. The pinion 37 driven by the motor 34 cooperates with the particular rack 48 aligned with the rack 38 in moving the carriage to and from the main carriage 45.

When a pair of tracks 47 is aligned with the tracks 24, the tracks 50 provided on a bed part 51 of the grinding machine are aligned with the last-mentioned pair of tracks 47. The tail stock 42 may be stored on the tracks 50 and moved from these tracks over the aligned pair of tracks 47 to the tracks 24.

The main carriage 45 is driven on the tracks 44 by an electric motor 53 mounted on the carriage 45 and having suitable flexible electrical connections with a source of current. The motor 53 drives a worm 54 meshing with a worm wheel 55 which, as shown in FIG. 3, drives a pinion 56 meshing with a rack 57 in fixed relation to the bed part 43. The carriage may be reciprocated on the bed part 43 through these power connections to align any pair of tracks 47 with the tracks 24. There is shown in FIG. 1 a workpiece 60 supported from a carriage 23 on one pair of tracks 47, this pair being shown out of alignment with the tracks 24. The workpiece 60 may be a roll similar to the workpiece 19.

The operation of the grinding machine will be manifest from the foregoing description. After the workpiece 19 is ground in a conventional manner by the grinding wheel head assembly, the head stock is released from the workpiece. The adjusting and clamping members 32 are released to permit travel of the carriage along the track 24, and the motor 34 of the carriage is energized to drive the motor in a direction to remove the carriage 23 from the bed part 11 and onto the main carriage. The motor 53 of the main carriage may then be energized to move the last-mentioned carriage in a direction to bring the workpiece 60 on its carriage into alignment with the tracks 24. The motor of the last-mentioned carriage may then be energized to drive the carriage onto the tracks 24 and position the workpiece 60 in proper relationship along the tracks with reference to the grinding wheel head assembly. The adjusting members 32 of the carriage may then be operated to prevent dislocation of the carriage on the tracks and to assure alignment of the axis of the carriage with the path of the grinding wheel head assembly parallel to the tracks 24.

While this is happening, a crane, not shown, may be brought into position to remove the finished workpiece from its carriage. After the threaded holding members 30 are released, slings may be placed around the roll. The workpiece 19, together with its journal boxes, may be removed from the carriage by the crane and another work-

piece positioned on the carriage by the crane. The journal boxes of the last-mentioned workpiece may be adjusted on the carriage by the members **30** and the workpiece **19** stored by the crane in a suitable location. After the workpiece **60** is ground by the machine, it is removed from the machine in a similar manner. It should be noted that, due to the provision of three pairs of tracks **47** on the main carriage, three carriages **23** may be employed on the grinding machine, if desired.

It will be manifest from the foregoing that the construction of the roll grinder is such that rolls may be quickly conveyed to and from grinding position on the grinding machine. Furthermore, the rolls may be guided very precisely to and from grinding position due to the employment on the machine of the auxiliary or subcarriages **23**. In FIG. 2 there is shown on the side of the roll **19** opposite the grinding wheel head assembly **14** an electrical roll-probing device **61** for probing the roll to determine its surface characteristics. Such a device might easily be rendered out of order if bumped by a roll, but due to the particular construction and arrangement of the means to convey a roll to and from grinding position, the likelihood of a roll striking such a device on the machine is quite small.

In FIG. 6 there is shown a somewhat modified form of the grinding machine. Here the roll which is to be ground is supported on a carriage **62** similar to the above-described carriages **23**, but the carriage **62** does not support the roll in the journal boxes in which the roll is mounted in the mill. The bearings are removed from the roll before it is ground and the roll is supported on the carriage **62** by open bearings, one supporting each roll journal, one such support being indicated generally at **63** in FIG. 6.

The support **63** comprises an upright member having a base secured to the carriage **62** in any suitable manner. The aforementioned upright member, indicated at **64**, has at the upper part thereof a recess **65** receiving a bearing block **67** extensible therefrom for engagement laterally with the corresponding roll journal. The block **67** may be provided with a lining of bearing material to engage the last-mentioned roll journal. The block may be moved laterally toward and away from the journal for adjustment of the roll end toward or away from the path of the grinding wheel along the roll face, the adjustment being made as by member **68** threaded into the member **64** and operatively connected to the block **67** to extend or retract the latter.

At the remote side of the axis of the roll and in a lower position the supporting member **64** is provided with a bearing block **69** similar to the block **67**, the block **69** being movable in a recess **70** formed in the support member **64** and being extensible therefrom. The block **69** cooperates with a wedge **72** movably mounted in the recess **70**. Movement of the wedge in one direction tends to extend the block **69** from the recess **70** while movement in the other direction permits the block **69** to be retracted in the recess **70** by gravity. The wedge **72** is adjusted by a shaft **73** having a threaded portion received in a tapped hole in the wedge **72** and extending in nonthreaded relation through a suitable bore in the support member **64** for access by a tool such as a wrench so that the shaft may be turned to move the wedge **72** axially on a shaft **73** to effect extension or retraction of the journal support block **69**. The wedge **72** is held against rotation on the shaft **73** as by the engagement of the block **69** therewith. Adjustment of the block **69** affects the height of the roll. The roll, of course, is not held down on the carriage **62**. The machine is operated in a manner similar to the machine shown in FIG. 1.

In the further modification of the machine shown in FIG. 7 the machine is provided with three independent grinding wheel head assemblies indicated generally at **75**, each of which is served by a main carriage **76** similar to the carriage **45** previously described. The operation of the machine is similar to that of the form shown in FIG. 1. As shown in FIG. 7, the workpieces on the machine indicated at **77–81** are of different sizes. Of course, workpieces of different sizes may be accommodated on the machines of the other two forms described above.

It will be manifest from the foregoing description that there is provided in accordance with the invention a roll grinder having improved means for loading and unloading rolls from the grinder. The machine permits much faster delivery of rolls to and from the grinder and the rolls are loaded and unloaded in a safer manner to effectively inhibit bumping and consequent damage to the machine.

While several forms of the roll grinder have been illustrated in the drawings and described above, it will be apparent to those versed in the art that the roll grinder may take other forms and is susceptible of various changes in details without departing from the principles of the invention and the scope of the appended claims.

What I claim is:

1. In a grinding machine for grinding an elongated workpiece and having a grinding wheel head assembly for reciprocating movement lengthwise of the workpiece on a path provided on a bed part, the combination of a second bed part, a first guide means on said second bed part extending parallel to the aforementioned path of the head assembly, a main carriage, a plurality of second guide means independent of and parallel to one another on the carriage and extending axially of said first guide means, said carriage being movable rectilinearly and transversely of said first guide means to selectively align therewith any one of said second guide means, a third bed part having means to guide said movement of the carriage, and a plurality of workpiece-supporting subcarriages for movement from the main carriage on any one of said second guide means to said first guide means and then back to the main carriage on a different one of said second guide means after a grinding operation and selective movement of the main carriage, each subcarriage being adapted to support a workpiece for a grinding operation thereon, said first guide means receiving sequentially each workpiece-supporting subcarriage in a position in which the workpiece may be ground by the grinding wheel head assembly.

2. A grinding machine as defined in claim 1 wherein said first and second guide means comprise tracks and the subcarriages are provided with wheels engageable with said tracks.

3. A grinding machine as defined in claim 1 wherein the main carriage and the subcarriages are power driven.

4. A grinding machine as defined in claim 2 wherein the main carriage and the subcarriages are power driven.

5. A grinding machine as defined in claim 3 wherein each subcarriage is provided with adjusting means to substantially align the axis of the workpiece with the axis of the subcarriage.

6. A grinding machine as defined in claim 5 wherein each subcarriage is provided with adjustable means engageable with means in fixed relation to said first guide means to align the subcarriage substantially in parallelism with the path of the head assembly and inhibit dislocation of the subcarriage along said first guide means while the workpiece on the last-mentioned carriage is being ground.

7. A grinding machine as defined in claim 5 wherein the workpiece is a mill roll having its mill bearing assemblies on its journals for supporting the roll on the subcarriage, said adjusting means coacting between the subcarriage and said bearing assemblies.

8. A grinding machine as defined in claim 7 wherein adjusting means is provided coacting between the subcarriage and a part in fixed relation to said guide means to align the subcarriage substantially in parallelism with the path of the head assembly and hold the subcarriage in position during a grinding operation.

9. A grinding machine as defined in claim 3 wherein the workpiece is a mill roll provided with journals at its

ends and the subcarriage comprises a pair of open journal supports, each provided with means for adjusting the corresponding journal in two planes substantially normal to one another to properly position the roll with reference to the path of the head assembly.

10. A grinding machine as defined in claim 3 wherein

a plurality of independent grinding wheel head assemblies are provided and a plurality of said first guide means, one for each head assembly, each head assembly being served by said main carriage through the corresponding one of said first guide means.

No references cited.