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Ryan et al.

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[54] CRUSH DRESSING CONTROL MECHANISM

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[52] **U.S. Cl.**.....**51/165.78,** 51/165.87

[51] **Int. Cl.**.....**B24b 49/18**

[58] **Field of Search**.....51/165.75, 165.87, 165.78, 51/165.79, 165 R; 192/143; 125/11 CD

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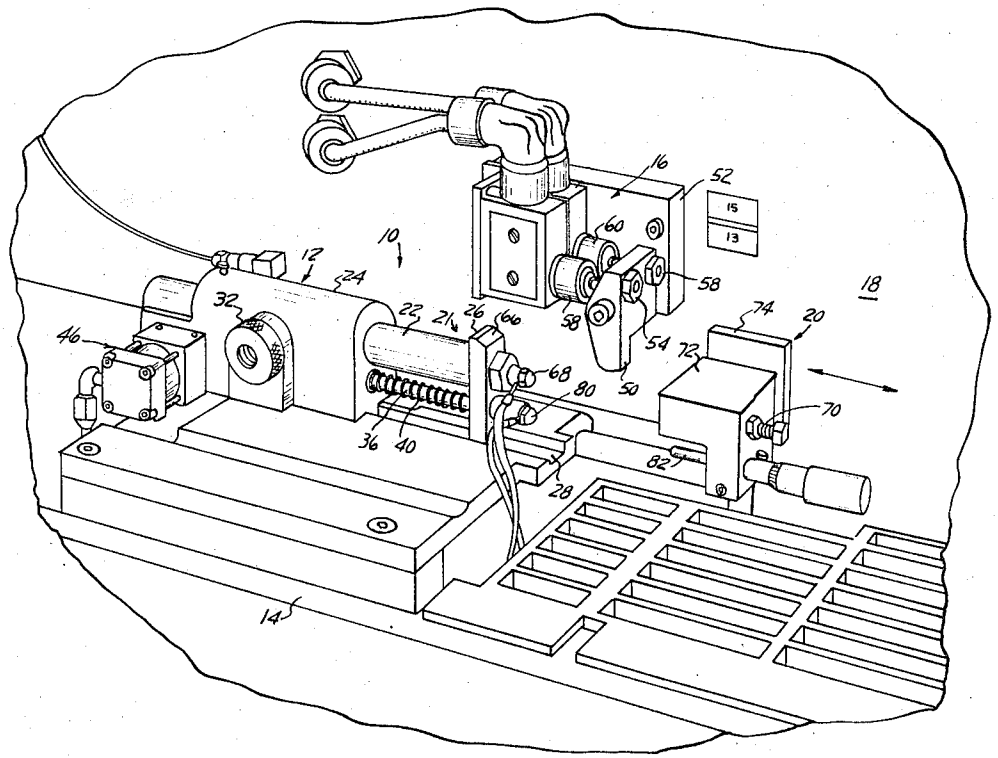
[57] **ABSTRACT**

A mechanism for controlling the infeed point at which the crush dressing sequence occurs for grinding machines including a position referencing rod slidably fitted in a base with a friction snubbing means preventing free motion therein and positioned by a driving engagement with the wheelhead during infeed motion, and an arrangement producing reduction of the wheelhead infeed to the crush feed rate after a predetermined extent of relative motion therebetween, combined with a spring biased pin slidable in the base and fixed during crush cycling, and controlling the depth of crush by an agreement which discontinues the low speed traverse after a predetermined extent of relative motion between the wheelhead and the pin, thereafter the pin being relocated on a plate carried by the position referencing rod. By this arrangement, the wheelhead returns to the point of the previous crush cycle at a rapid traverse infeed while the crush depth of each cycle remains the same.

4 Claims, 3 Drawing Figures



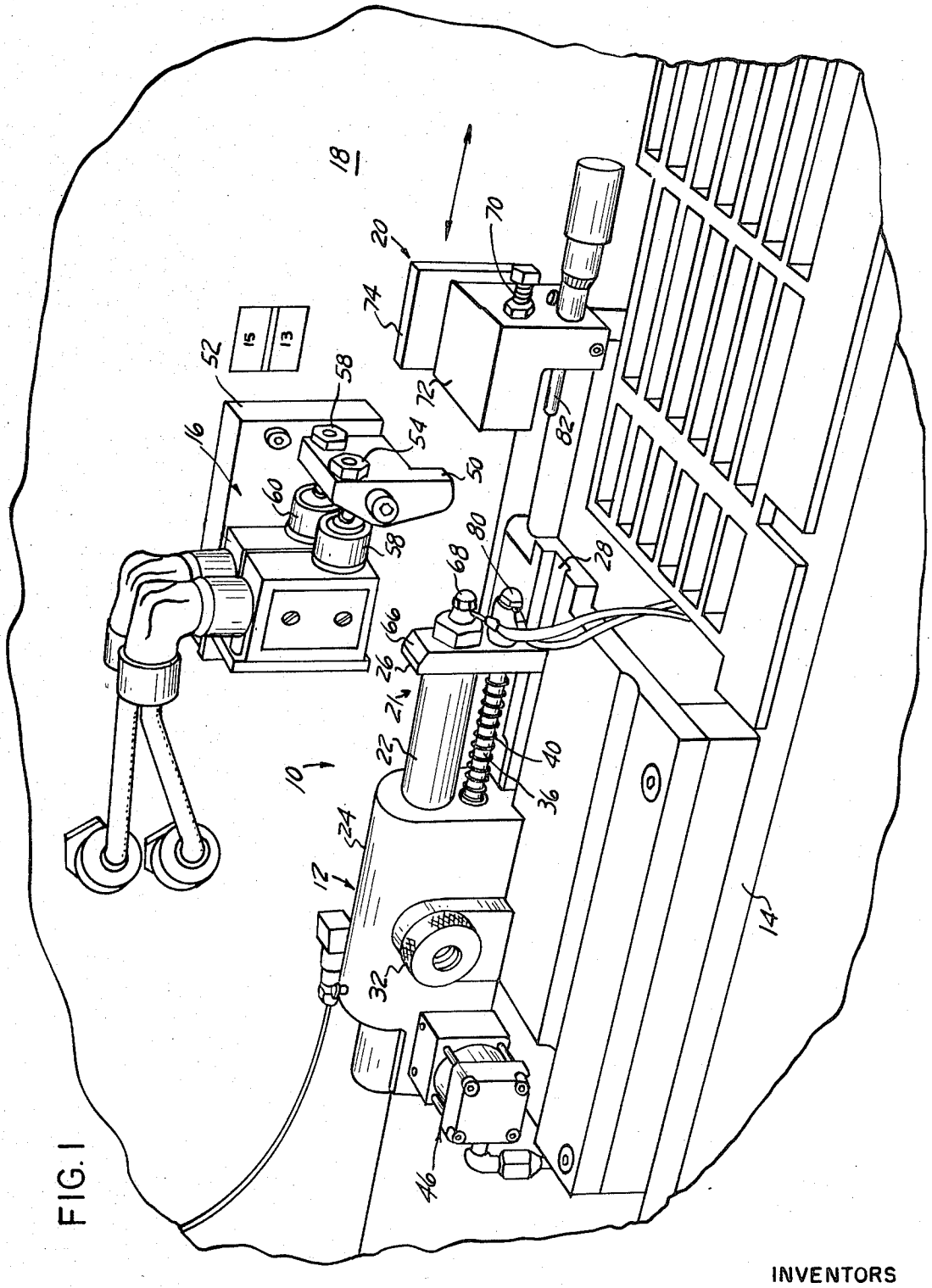


FIG. 1

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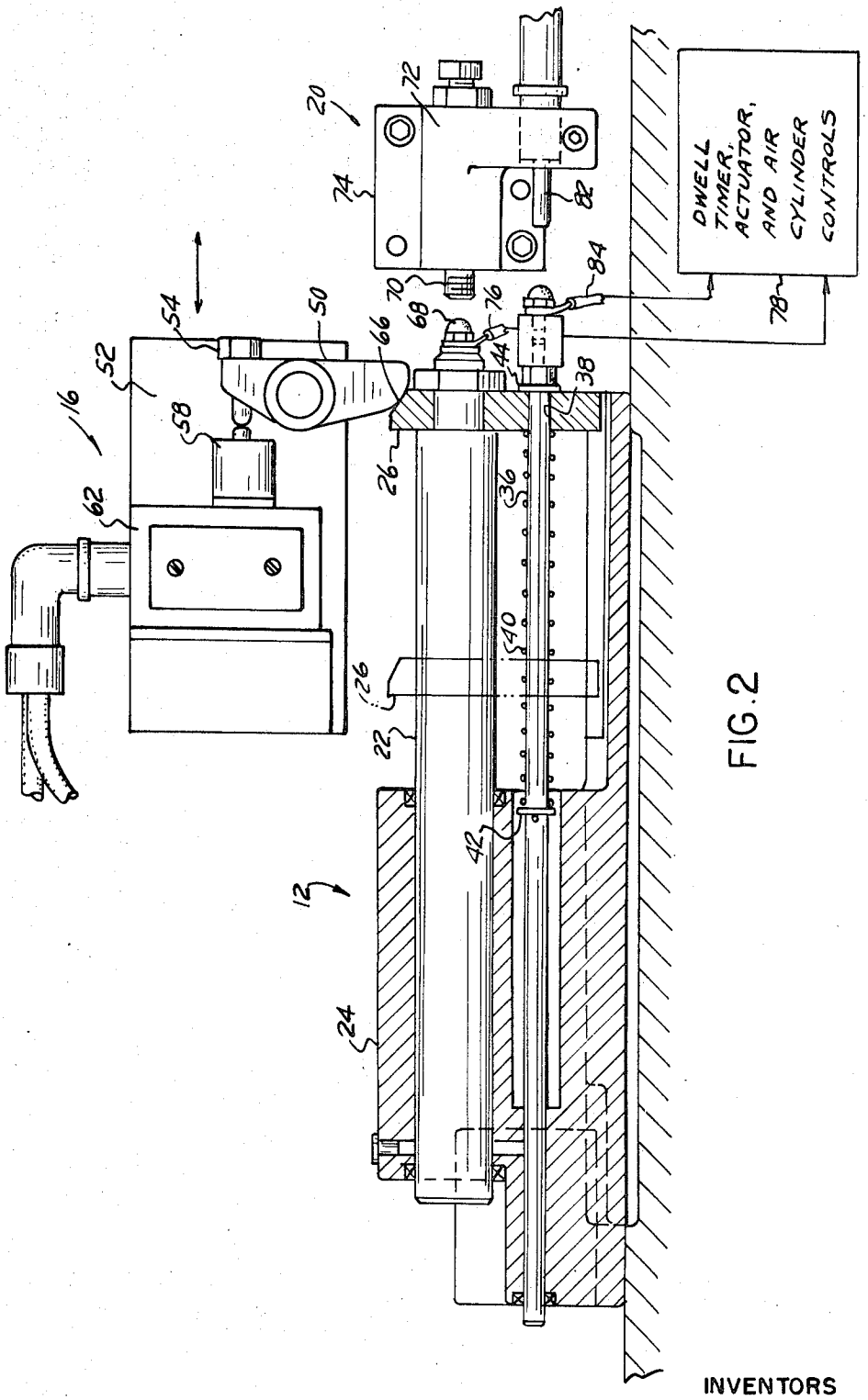

FIG. 2

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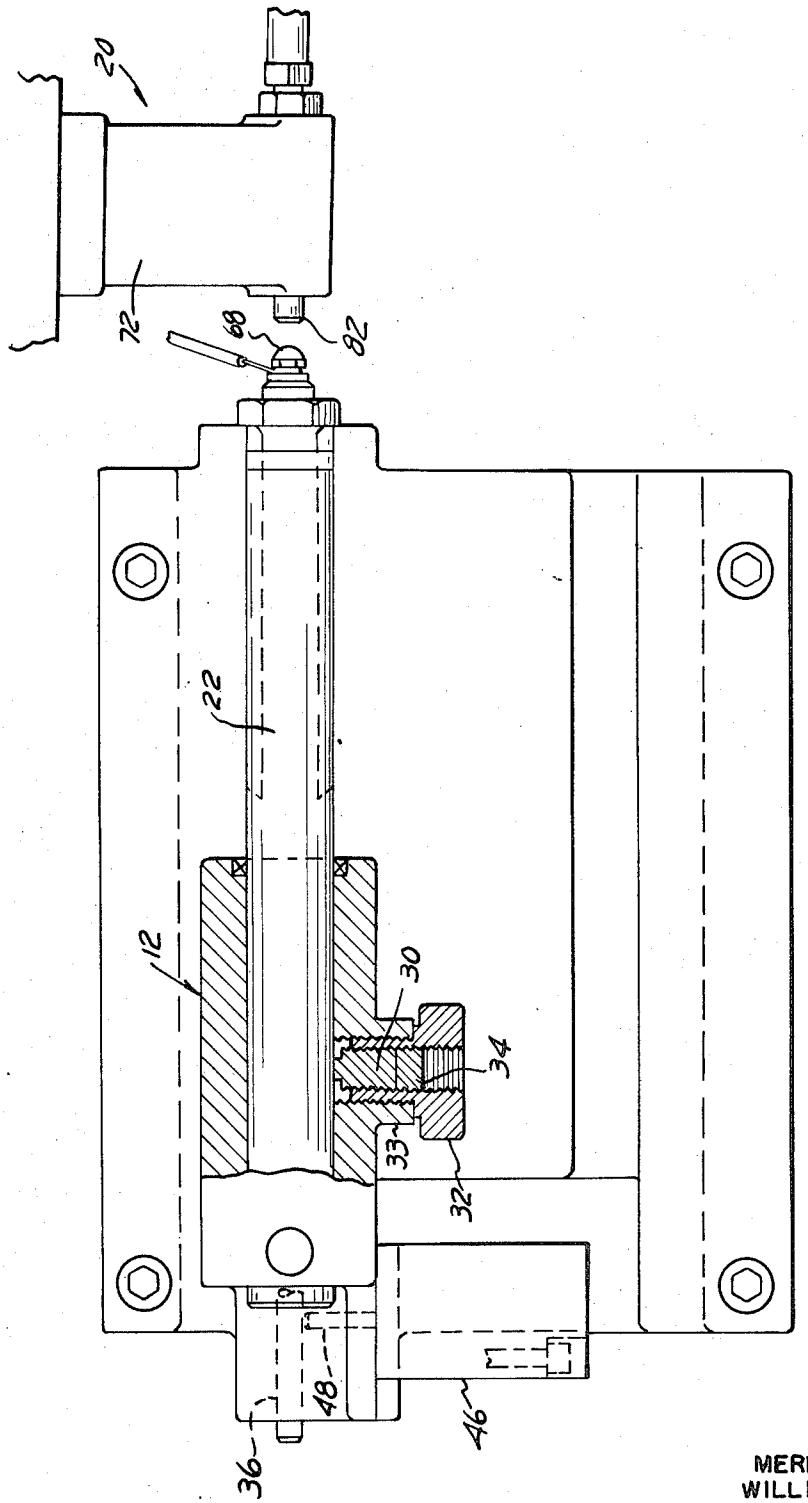

FIG. 3

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CRUSH DRESSING CONTROL MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention concerns grinders and more particularly crush dressing control mechanism for form grinders.

2. Description of the Prior Art

Modern grinders are often equipped for automatic crush dressing cycling, in which the grinding wheel is advanced into crush rollers after a predetermined number of machining cycles in order to true the shape of the grinding wheel and renew its surface. During each crush dressing cycle, the wheelhead is moved forward in a two-stage motion in that it is rapid traversed until reaching the vicinity of the crush rollers, and then slowly advanced into rolls while being rotated. As the grinding wheel is worn down by successive crush dressings, it would be advantageous to shift inwardly the point at which rapid traverse is discontinued, as excessive machine time would be wasted infeeding the wheelhead at the slow crushing rates through the distance corresponding to the previously removed grinding wheel material. In addition, it would be desirable to accomplish this end while maintaining a uniform depth of crush in each cycle.

These needs have been met in the past by mechanisms which included a heavy slide block moved through ways by engagement with the wheelhead, combined with a complex, relatively high mass crush depth control assembly which controlled the depth of crush by indirect contact with the wheelhead via the slide block and was then relocated against the slide block after each cycle.

This approach, while satisfactory in most respects, created significant maintenance problems as the heavy slide block would often become jammed in its ways after extended usage. In addition, the relatively high mass crush depth control assembly required a relatively heavy slide block, as in the process of relocating this assembly against the slide block, shifting of the block due to impacts therewith could occur leading to loss of correspondence between the maximum infeed point of the grinding wheel and the slide block. In addition, this arrangement required the precision adjustment means to be carried by the moving crush control assembly increasing the mass of the assembly and subjecting the adjustment mechanism to impacting upon relocation with the slide block. Further, the mounting of the assembly is rendered relatively complex by the arrangement in which indirect contact between the wheelhead and the crush control assembly is used to trigger the cycle end.

Therefore, it is an object of the present invention to provide such a mechanism which does not involve heavy slide blocks and which is simplified over prior art mechanisms.

SUMMARY OF THE INVENTION

This and other objects which will become apparent upon a reading of the following specification and claims are accomplished by utilizing a position referencing rod slidably fitted in a base and positioned by a driving engagement with the wheelhead during infeed movement with the transition to low speed traverse triggered by a predetermined amount of relative movement therebetween, and combined with a spring biased pin slidable in the base and fixed during crush cycling and controlling the depth of crush by an arrangement which discontinues the low speed traverse after a predetermined extent of relative motion between the wheelhead and the pin, thereafter being released to be relocated on a plate carried by the rod. Thus, the wheelead returns to the maximum infeed point of the previous crush cycle at a rapid traverse speed while the depth of crush remains the same.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the crush dressing control mechanism according to the present invention.

FIG. 2 is a front elevational view in partial section of the mechanism shown in FIG. 1.

FIG. 3 is a plan view in partial section of the mechanism shown in FIG. 1.

DETAILED DESCRIPTION

In the following detailed description, certain specific terminology will be utilized for the sake of clarity and specific embodiments will be described in order to provide a complete understanding of the invention, but it is to be understood that the invention is not so limited and may be practiced in a variety of forms and embodiments.

Referring to the drawings, and particularly FIG. 1, the crush control mechanism 10 includes a position referencing assembly 12 fixed to the machine base 14, a control switch assembly 16 fixed to the machine wheelhead structure 18, and a contact assembly 20, also affixed to the wheelhead 18.

The position referencing assembly 12 includes a position referencing rod assembly 21 including a rod member 22 slidably mounted within a bore in a fixed housing 24.

Assembly 21 also includes a plate 26 affixed to one end of the rod 22, supported for sliding movement in a groove 28.

Movement of the rod 22 in the bore is frictionally snubbed by means of an adjustable drag element 30 (FIG. 3) which is threaded into a release knob 32 in turn threaded into a boss 33. The drag element 30 is maintained in an adjusted position therein by means of a locking member 34 also threaded into the release knob 32. Thus, by adjusting the position of the drag member 30, a varying force can be applied to the rod 22 which can be readily released and reapplied by rotating the release knob 32 into and out of seating on the boss 38 without disturbing the adjusted drag force.

A pin element 36 is also slidably disposed in the housing 24 and passes through an opening 38 in plate 26.

A compression spring 40 seated at one end on washer 42 and at the other on the inner surface of plate 26 biases the pin 36 to the left as viewed in FIGS. 1 and 2 to tend to cause it to seat on shoulder 44 affixed to the pin 36 on the outside surface of plate 26 as shown in FIGS. 1 and 2.

An air cylinder 46 is provided that normally fixes pin 36 to the housing 24 by means of a clamping pin 48 (FIG. 3), but upon actuation, releases the pin 36 to allow it to move freely in the housing 24.

Switch assembly **16** controls the transition of the wheelhead **18** infeed motion from the initial mode of a rapid traverse called for by the automatic controls (not shown) to the second mode of a slow crush infeed speed. This is accomplished by the use of a rocker cam **50** rotatably mounted to a bracket **52** fixed to the wheelhead **18** and having a pair of adjustable actuating bolts **54, 56** threaded through the upper portion of the rocker cam **50**.

The actuating bolts **54, 56** are disposed opposite a pair of switches **58, 60**, respectively, which control electro-operated a pair of valves (not shown) which in turn control fluid flow to the wheelhead infeed actuator such that upon actuation of one valve, the infeed rate is reduced to slower precrush traverse and upon actuation of the other valve the infeed rate is reduced further to the crush infeed rate. By adjusting the position of the actuator bolts **54, 56** in the rocker cam **50**, the time delay between actuation of switches **58** and **60** and corresponding valves may be readily controlled.

The rocker cam **50** is rotated by engagement with cam surface **66** on the plate **26** after a predetermined extent of relative motion between the wheelhead **18** and the rod assembly **21** as the wheelhead moves to the left as viewed in FIGS. **1** and **2**.

Sufficient lost motion exists in the switches **58, 60** so that the rocker cam **50** may be continued to be rotated as the wheelhead **18** advances, allowing switch assembly **20** to approach the position referencing assembly **12** until an acorn nut **68** engages an adjustable position contact **70** threaded through a block member **72** secured to the wheelhead **18** by means of a bracket **74**.

This completes an electrical circuit via lead **76** which by means of controls depicted in block form at **78** causes the grinding wheel to be slowly rotated as it is advanced into the crush rolls to perform the crush dressing operation.

Further advancing of the wheelhead **18** causes movement of the plate **26** and attached rod **22** to the left as viewed in FIGS. **1** and **2** due to the driving engagement of the acorn nut **68** and adjustable contact **70**.

Pin **36**, however, is held stationary by means of the air cylinder **46** and its operating rod **48** so that the spring **40** is compressed by the leftward movement of the plate **26** and relative movement occurs between the wheelhead structure **18** and the pin.

This movement continues until a predetermined extent of relative travel between the wheelhead structure **18** and the pin occurs causing an acorn nut **80** fixed to the pin **36** to contact a micrometer screw adjusted contact **82**, which is mounted for precision adjustment in the block **70** to accurately control the depth of the crush. This completes a circuit via lead **84** by means of the control **78** so that further infeeding is discontinued while the grinding wheel continues to rotate slowly to finish trueing the wheel for an interval of time determined by a timer included in the control circuitry **78**.

During this same time interval, the air cylinder **46** is activated, retracting operating rod **48** to release pin **36**, which acting under the influence of compression spring **40**, moves to the left to engage the plate **26** outer surface to be thus relocated thereby.

Upon completion of the timed interval, the air cylinder is deactivated to again lock the pin **36**, and thereafter the grinding wheel is retracted to its normal operating position at rapid traverse rate.

Thus, in the succeeding cycle, the plate **26** will be positioned to the left precisely to the extent of the crushing depth of the previous cycle so that the wheelhead **18** will be rapid traversed correspondingly further before the transition to the slow speed crush sequence is initiated, while the crush depth remains exactly the same by virtue of the relocation of the pin **36** to the rod assembly **21** at the end of the previous forward motion cycle.

It can be appreciated that this function has been provided without the use of heavy slide blocks and ways, and by means of an extremely simple mechanism, as contrasted to the described prior art.

Many variations are of course possible within the scope of the invention.

What is claimed is:

1. An improved arrangement for controlling the motion of a grinding machine wheelhead structure of the type that includes means for infeeding the grinding wheel into engagement with a dressing mechanism initially at a rapid traverse rate and then a slower dressing rate as the dresser mechanism is approached, the arrangement including:

a rod assembly including a rod supported for a sliding motion in a base;

means causing said rod assembly to be drivingly engaged with said wheelhead during its forward motion so as to be moved therewith;

means for causing said wheelhead movement to shift from said rapid traverse rate to said slower dressing rate in response to a predetermined relative movement between said wheelhead and said rod assembly;

means discontinuing said forward cycle motion of said wheelhead and initiating return motion thereof in response to a predetermined amount of movement of said drivingly engaged wheelhead and rod assembly said means including:

an element disposed to be drivingly contacted by said drivingly engaged wheelhead and rod assembly after a predetermined extent of relative movement between said element and said wheelhead and also including locator means fixing said element during cycling movement of said wheelhead but moving said element to be located by said rod assembly position in response to said discontinuance of said forward cycle motion, whereby the extent of said rapid traverse modal movement increases after each cycle but the extent of said slow rate modal movement remains constant.

2. The arrangement of claim **1** wherein said locator means includes means biasing said element into driving engagement with said rod assembly and means releasing said element when said forward motion is discontinued and before said return motion occurs.

3. The arrangement of claim **1** including means creating a direct driving contact between said element and said wheelhead.

4. The arrangement of claim **3** wherein adjustment means is carried by said wheelhead for varying the extent of said predetermined movement causing said discontinuance of forward motion.

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