Oct. 6, 1970 J. W. COOK 3,532,231

SLAB HANDLING APPARATUS

Filed Jan. 16, 1968 3 Sheets-Sheet 1

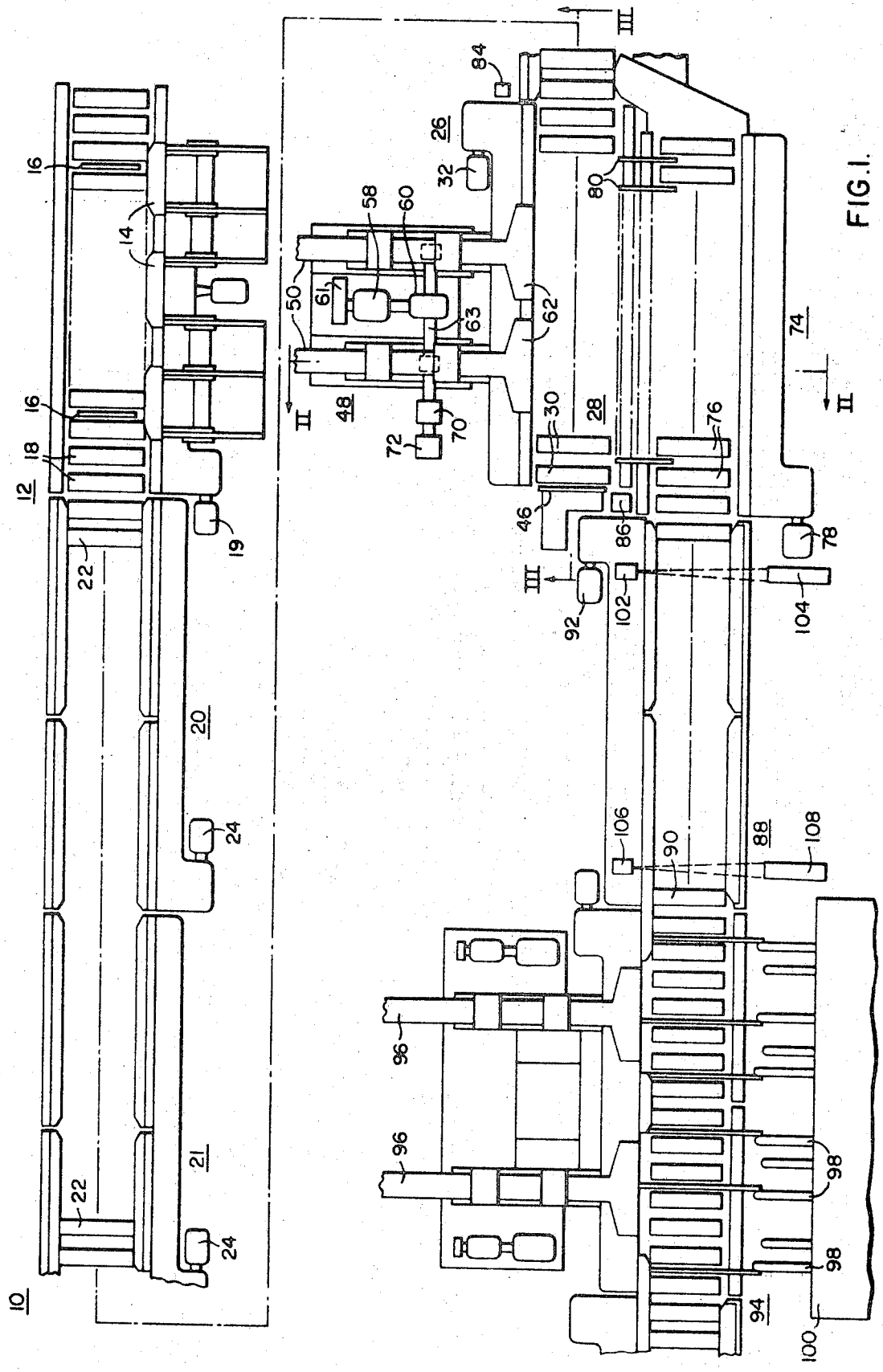
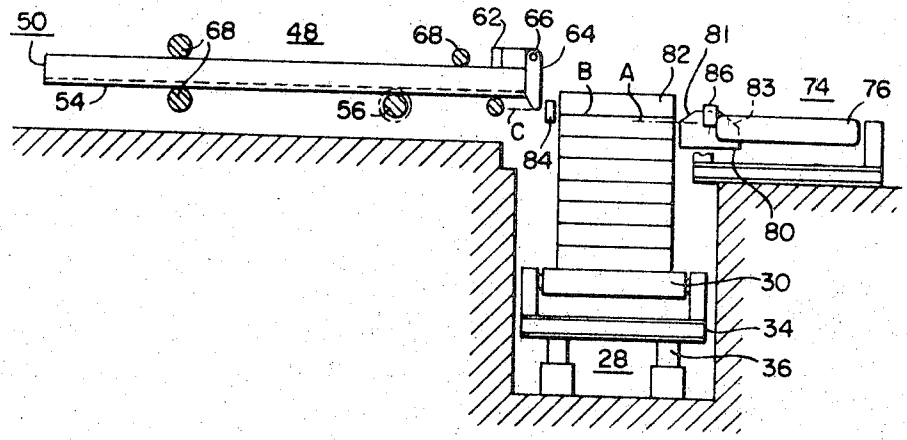


FIG. 1.


50
68
48
68
62
66
64
81
82
B
A
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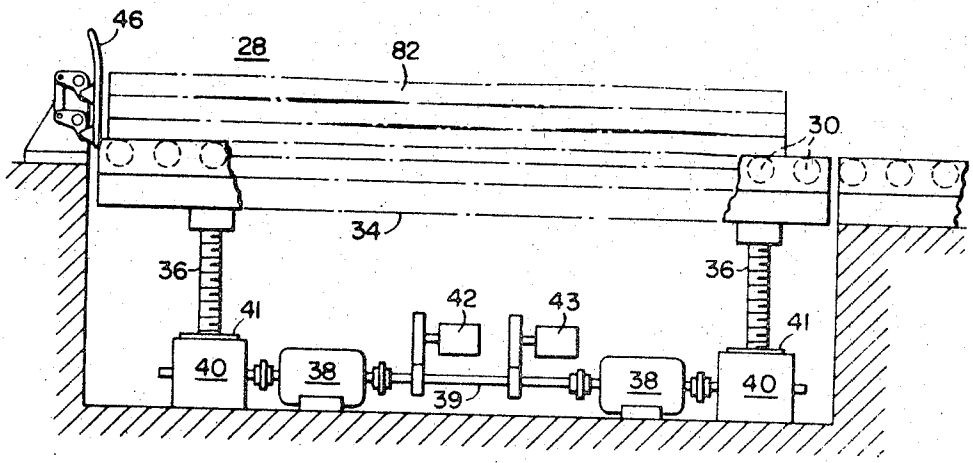
83
74
76
54
56
C
84
80
30
34
28
36

FIG. 2.


46
28
82
30
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36
36
41
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43
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38
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38
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FIG. 3.

Oct. 6, 1970 J. W. COOK 3,532,231

SLAB HANDLING APPARATUS

Filed Jan. 16, 1968 3 Sheets-Sheet 3

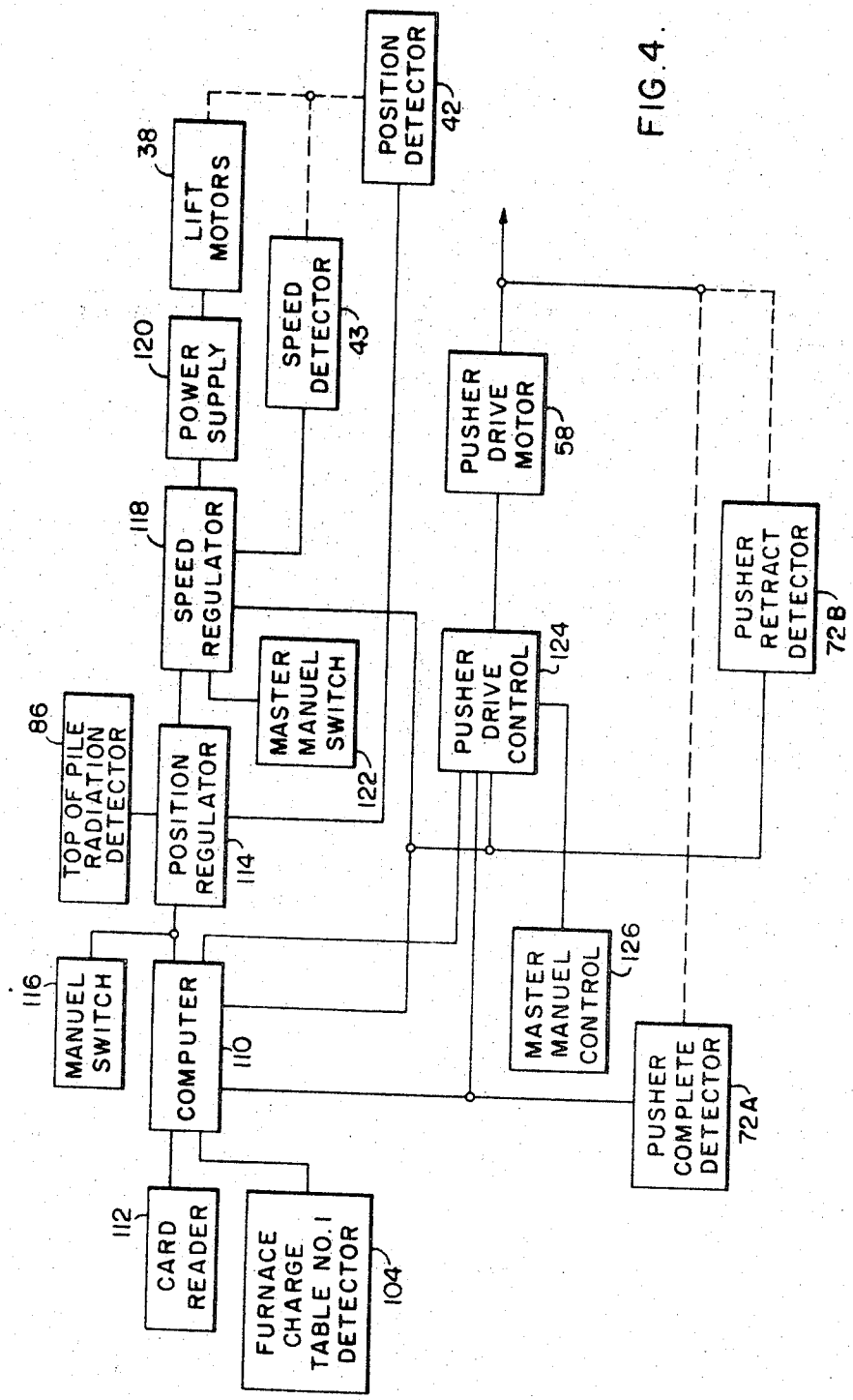

FIG. 4.

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SLAB HANDLING APPARATUS

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8 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to apparatus for handling a pile or a stacked plurality of slab members including a depiler table for receiving a pile of slabs and a pusher for displacing the topmost slab of the pile from the depiler table onto a second table. The second table conveys the slab members one at a time to be further processed before the next slab member is pushed from the pile onto the second table. The depiler table may be moved up and down to accommodate the pile of slab members and to reposition the topmost slab member after the preceding slab member has been pushed onto the second table so that the pusher may remove the penultimate slab member. In order to facilitate this operation, a suitable means for detecting the surface of the topmost slab member such as a photocell provides an indication of when the depiler table has reached a given position. Suitable information indicative of the thickness of the slab members is fed into a computer which controls the position of the depiler table. Thus when the computer is signaled by the detection means that the surface of the topmost slab member has reached the given position the computer allows the depiler table to travel through an additional distance depending upon the thickness of the topmost slab before it brings the depiler table to a depiling position. Next, the pusher, which is now aligned with the topmost slab member is activated to push the topmost slab onto the second table.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to apparatus for handling members, and more particularly to the apparatus for handling a pile of slabs of steel to be sorted for lateral processing within a steel mill.

Description of the prior art

In the initial stages of steel production, the molten steel is poured into forms or molds for processing to slab members of the steel. The slabs are brought to the next area where they are further processed by a reheating step and a subsequent series of rolling steps. Typically, a pile of slab members are brought to the processing area by a crane which is suspended above the processing area. Each pile may include as many as ten or twelve slab members. The slab members cannot be processed while they remain stacked in a pile, but must be depiled so that they may be treated individually one at a time. The unstacking operation is typically performed by a device known in the art as a depiler or unpiler, which may take the form of a depiling table which is movable up and down to allow a pusher to displace the topmost slab from the pile and to place it on a second table. The depiling table may be disposed by a suitable drive means in line to receive the pile of slabs from a slab receiving table, where the slabs are originally disposed by the crane. Next, the operator manually brings the depiler table to a height at which the pusher may displace the topmost slab. The operator must visually check the position of the topmost

slab to insure that the pusher does not engage the penultimate slab and so that the topmost slab may be pushed onto the second table without striking the edge of the second table or falling from too great a height above the second table. In the prior art, the positioning of the depiler table was checked individually for each operation of the pusher by the operator, which would demand an excessive amount of the operator's attention and would distract him from controlling the further processing of the slab members.

It is therefore an object of this invention to provide a new and improved method and assembly for unpiling a pile of slabs which will require a minimum of attention from a supervising operator.

More specifically it is an object of this invention to provide a new and improved method and apparatus for handling a pile of slabs in which the topmost slab of the pile is correctly positioned with respect to the pusher and the table onto which the slab is to be placed.

SUMMARY OF THE INVENTION

These and other objects are accomplished in accordance with the teachings of the present invention by providing a new and improved apparatus and method of handling piles of slab members including a depiler table for receiving a pile of the slab members, a pusher for removing the topmost slab members, and a second or furnace charging table for receiving and conveying the slab members one at a time. The depiler table is capble of moving from a pile receiving position to a second position in which the topmost slab member may be slid by the pusher from the pile onto the furnace receiving table. More specifically, the depiling table should be disposed so that the pusher will strike only the topmost slab and that the topmost slab member may be slid onto the furnace receiving table without jamming or without being dropped from too great of an elevation onto the furnace charging table. Illustratively, this is accomplished with the aid of a computer circuit into which is fed the thickness of the respective slab members of the pile, and suitable means such as a photodetector for sensing the surface of the topmost slab member. As the depiler table is moving the pile of slab member upward, the latter detector provides a signal to the computer circuit indicating the passing of the topmost slab member. After a predetermined time corresponding to the thickness of the topmost slab member, the computer will cause the depiler table to stop and the pusher to be activated to displace the topmost slab member onto the furnace receiving or second table. After the slab member has been removed from the furnace receiving table and the pusher retracted, this process may be repeated until each of the slab members has been transferred from the depiler table to the furnace receiving table.

DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the present invention will become more apparent when considered in view of the following detailed description and drawings, in which:

FIG. 1 is a plan view of a slab entry system for supplying a plurality of slabs delivered in piles to furnaces and including a depiler system in accordance with the teachings of this invention;

FIG. 2 is a cross-sectional view of the depiler assembly and the pusher of FIG. 1 as taken along line II–II of FIG. 1;

FIG. 3 is a cross-sectional view of the depiler table of FIG. 1 taken along line III—III of FIG. 1; and

FIG. 4 is a schematic diagram of the control system for sensing and regulating the motion of the depiler table and the pusher in accordance with the teachings of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and in particular to FIG. 1, there is shown a slab entry system **10** for accepting a pile of slab members delivered by a crane and for successively removing the topmost slab member and conveying it to the next processing station. The slab entry system **10** includes a slab receiving table **12** upon which a pile of slab members is placed. The slab receiving table **12** includes a plurality of slab side bumpers **14** in order to facilitate the depositing of the pile of slab members or workpieces accurately upon the table **12**. The slab receiving table **12** is made up of a plurality of rollers **18** which are rotated to convey the pile of slab members to the left as shown in FIG. 1 by a drive motor **19**. The motor **19** is effectively connected through gearing (not shown) to each of the rollers **18**. In order to prevent damage to the rollers **18** and their associated gearing mechanism, a plurality of slab lowering cradles **16** are disposed between the rollers **18**. During the depositing of the pile of slab members, the slab lowering cradles **16** are lifted above the level of the rollers **18** by an appropriate drive motor and connecting gear assembly. It is understood that as many as ten or twelve slabs with a total weight in the neighborhood of 100 tons are deposited upon the slab receiving table **12** and that the crane delivers the pile of slab members with a dropping force which would normally damage the rollers. Thus, during the delivery of the pile of slab members, the slab lowering cradles **16** are extended to receive the shock of the pile of slab members and then are slowly lowered to gently deposit the pile of slab members onto the rollers **18** of the slab receiving table **12**.

The pile of slab members are conveyed to the left as seen in FIG. 1 by depiler entry tables **20** and **21**. The tables **20** and **21** are each made up of a plurality of rollers **22** and drive motors **24**, which are connected by suitable gearing to the rollers **22** for moving the pile of slab members to a depiler assembly **26**. The depiler assembly **26** includes a depiler table **28**, which as will be explained later, is capable of moving up and down to first accept the pile of slab members and then to adjust the level of the topmost slab member so that it may be displaced by a pusher assembly **48** onto a first furnace charging table **74**. The depiler table **28** includes a plurality of rollers **30** which are driven by a motor **32**. The pusher assembly **48** includes a pair of pushers **50** which are driven by a pusher drive motor **58** forward to push the topmost slab member onto the table **74** and to retract the pushers **50** while the pile of slab members is being repositioned.

The first furnace charging table **74** includes a plurality of rollers **76** which are connected to and driven by a motor **78** by a suitable gearing (not shown). A plurality of skids **80** are disposed between the rollers **76** and extend to but not inbetween the rollers **30** of the depiler table **28**. As will become evident in the later discussion, the skids **80** serve to allow the slabs to be slid from the depiler table **28** to the first furnace charging table **74** without jamming against or falling upon the rollers **76**.

When the motor **78** is activated, the slab member disposed upon the first furnace charging table **74** will be conveyed to the left as shown in FIG. 1 onto a second furnace charging table **88** made up of a plurality of rollers **90** and a drive motor **92** effectively geared to drive the rollers **90**. As shown in FIG. 1, the entry of a slab member onto the second furnace charging table **88** is sensed by a source **104** of radiation and a suitable radiation detector **102** such as a photocell which are disposed in a line which transverses the path of the slab members along the second furnace charging table **88**. More specifically, the beam of radiation emitted by the source **104** is intercepted by one of the slab members. As the slab member passes down the second furnace charging table **88**, the beam of radiation emitted by the source **104** will be reestablished onto the radiation detector **102** to indicate that the slab member has now left the first furnace charging table **74**. As the slab proceeds to the left upon the second furnace charging table **88**, it will intercept a beam of radiation emitted by a source **108** and detected by a suitable radiation detector **106** such as a photocell. When the beam of radiation emitted by the detector **106** is intercepted, the radiation detector **106** indicates that the leading edge of the slab member has arrived at the far end of the second furnace charging table **88**. Normally, at this point in the processing of the slab member the second furnace charging table **88** will be brought to a stop until there is a command that the slab member may now be processed in a furnace **100**. It may be understood that a plurality of furnaces may be provided to heat the slab members. When one of the furnaces **100** is able to accept an additional slab member, the second furnace charging table **88** will convey the slab forward to the third furnace charging table **94**. If the furnace **100** associated with the third furnace charging table **94** can accept delivery of the slab member, a pusher assembly **96** will be activated to slide the slab member onto a plurality of skids **98** and into the furnace **100**. If the furnace **100** is not able to accept the slab member, the slab member will be conveyed by a plurality of furnace charging tables to a station corresponding to a furnace which may accept that slab member and a pusher assembly similar to the assembly **96** will deliver the slab member into the furnace.

The subject matter of this invention more specifically relates to the depiler table **28**. The pile of slab members are moved to the left as shown in FIG. 1 and are approximately centered on the table **28**. A depiler bumper **46** prevents slab members from inadvertently being off of the depiler table **28**. As more clearly shown in FIG. 3, the plurality of rollers **30** are supported upon a carriage **34**, which may be raised or lowered by a plurality (illustratively 2) of lift drive motors **38** which are effectively connected by a drive shaft **39** to each of a plurality of worm gears **40** disposed on the four corners of the carriage **34**. The worm gears **40** are in turn connected to drive the threaded drive shafts **36** in a vertical direction to either raise or lower the support carriage **34**. A plurality of nuts **41** are engaged with the threaded shafts **36** to provide a positive positioning of the shafts **36** and to provide a threaded surface to interact with the threaded shafts **36**. A suitable position detector **42** such as a shaft encoder, a selsyn transmitter or a cam switch is effectively connected by suitable gearing to the drive shaft **39** to detect the number of revolutions through which the shaft **39** is rotated and therefore the positions of the threaded shafts **36** and the depiler table **28**. Further, a speed detector **43** is similarly connected by gearing to the drive shaft **39** to detect the rotational velocity with which the motors **38** are driving the shaft **39**. A pile of slab members are disposed on the depiler table **28** and designated, as shown in FIG. 3, by the numeral **82**.

Referring now to FIGS. 1 and 2, the pusher assembly **48** includes a pair of the pushers **50**, which are driven forward and backward by the pusher drive motor **58**. The pusher drive motor **58** is connected through a reducing gear assembly **60** to drive a shaft **63**. In turn, the drive shaft **63** is connected to a pair of pinion gears **56**. As more clearly shown in FIG. 2, the pinion gears **56** engage the teeth of a rack **54** for driving the pusher **50**. The pusher **50** includes a shaft **52** upon which the rack **54** is secured and a pushing head **62** from which is suspended by a pin **66** a plurality of engaging teeth **64**. The shaft **52** of the pusher **50** is mounted as shown in FIG. 2 on a plurality of rollers **68** which confine the pusher **50** to a rectilinear motion. The drive motor **58** is capable of being operated in either direction to drive the pusher **50** in a reciprocating motion to push the topmost slab member **82** onto the table **74** and to pull the pusher **50** into a retracted position as shown in FIG. 2.

As shown in FIG. 2, the teeth **64** engage and slide the topmost slab member **82** of the pile disposed upon the depiler table **28** until the slab member **82** engages the

skids 80, which are contoured so as to lift the slab 82 over the edges of the rollers 76 and ton the top of the rollers 76. More specifically, the skids 80 have receiving surfaces 81 disposed to receive the slab members 82 and to lift the slabs over the leading or adjacent edges of the rollers 80, and a second surface 83 for gently lowering the slab member 82 onto the rollers 76.

As shown in FIG. 2, the lowermost edge of the receiving surfaces 81 of the skids 80 defines a level marked by the letter A. The bottom surface of the uppermost slab 82 must not be positioned below the level A if it is to be slid onto the table 74. More specifically, the lowermost surface denoted by the letter B of the uppermost slab member 82 must be positioned above the level A. In turn, the lowermost edge of the engaging teeth 64 is designated by the letter C and should be disposed above the level B of the lower surface of the uppermost slab member 82. As will be explained later, the depiler table 28 positions the pile of slab members 82 to meet these requirements so that the uppermost slab may be pushed by the teeth 64 onto the table 74. If the edge of teeth 64 is below the level B, the pusher 50 will strike the penultimate slab pushing it into the skid 80 thereby possibly damaging the pusher assembly 48 or the furnace charging table 74. The dimensions of the slab members 82 may not be all uniform and the shape of the slab as shown in FIG. 3 may be slightly bowed. In order to allow for variations in the dimensions and configurations of the slab members 82, several inches of the displacement are allowed between the surfaces C and A to compensate for discrepancies in the positioning of the slab members 82.

After a slab member 82 has been disposed upon the first charging table 74 by the pusher 50, the pusher 50 is retracted to its initial position. The teeth 64 are pivotally mounted by the pin 66 to allow the teeth 64 to rotate in a counterclockwise motion as seen in FIG. 2 if the teeth 64 strike portions of the depiling assembly or one of the slab members 82 while the pusher 50 is being retracted. In order to control the rectilinear motion of the pushers 50, a suitable brake 61 as shown in FIG. 1, is associated with the motor 58. Further, the drive shaft 63 is connected through a suitable reducing gear 70 to a limit switch 72 for providing an indication of when the pushers 50 are in a retracted position or in an extended position. The switch 72 may take the form of a cam switch with at least two cams for indicating the extended and retracted positions of the pushers 50.

As shown in FIGS. 1 and 2, suitable means are provided for sensing the position of the top surface (designated by the letter B) of the uppermost slab 82 of the pile disposed upon the depiler table 28. The detecting means illustratively takes the form of a source 84 for projecting a beam of radiation diagonally across the pile of slabs 82 to be sensed by a suitable radiation detector 86 such as a photocell. With reference to FIG. 2, it is desired to position the topmost slab member 82 at a position so that the teeth 64 of the pusher 50 will not abut against the penultimate slab member 82 and so that as the topmost slab member 82 is slid onto the skids 80 it will not fall from too great of a distance that would injure or damage the rolls 76. The radiation source 84 and detector 86 serve to successively detect the top surfaces of each of the slab members 82 in the pile. In order to accomplish this object, the source 84, and the detector 86 have been disposed so that the beam of radiation will not be intercepted by the second or penultimate slab 82 when the topmost slab member 82 has been slid onto the table 74. As a result, the source 84 and the detector 86 have to be disposed at an offset slightly above the level indicated by the letter B to thereby be able to detect the surface of the next slab member 82. Further, since the thicknesses of the slab members 82 may vary, the offset placement of the means of detection must also compensate for the variation of thickness of the slab member 82.

Referring now to FIG. 4, there is shown a control system connected to a computer 110 for synchronizing the operation of the depiler assembly 26, the first furnace charging table 74 and the pusher assembly 48. It may be understood that the computer 110 is a part of a large computer which is able to control the operation of the entire steel rolling process as well as the operation (now to be described) of sorting a pile of slab members 82. A card reader 112 of conventional design supplies input information into the computer 110. More specifically, a series of cards each coded with the respective thicknesses of the slab members 82 disposed upon the receiving table 12 is inserted into the card reader 112 in the order to be depiled, i.e. the topmost slab member 82 is the first slab to be depiled. This information is sequentially fed into and stored by a memory within the computer 110. The computer provides a reference signal indicating the thicknesses of the respective slab members 82 to a position regulator 114, which controls as will be explained the position of the depiling table 28. Instead of positioning the depiling table 28 automatically by the use of the computer 110, the operator may manually set the position regulator 114 by the use of a manual switch 116 to lift the table 28 a specified distance as set by the operator upon a dial of the switch 116. In turn the position regulator 114 provides an output signal indicative of the speed at which the lift motors 38 are to be operated. The output signal of the regulator 114 is applied to a speed regulator 118 which accurately controls the speed of the lift motors 38. The lift motors 38 may illustratively be variable voltage motors, each having an operational speed dependent upon the potential applied thereto. The variable potential is supplied by a power supply 120 to regulate the speed at which the motors 38 are operating. Illustratively, the power supply 120 could take the form of a DC generator or a thyristor control which is set by a signal derived from the speed regulator 118. With regard to FIG. 3, the motors 38 as explained above are connected to the drive shaft 39 which is in turn connected to the speed detector 43 and the position detector 42. The speed detector 43 may take the form of a tachometer whose output signal is dependent upon the speed of the drive shaft 39, and therefore the rate at which the depiling table 28 is moving. A speed indicating signal derived from the detector 43 is applied to the speed regulator 118, which may take the form of a controlled power supply whose output signal is dependent upon the feedback, speed indicating signal applied thereto. Thus, through the use of the feedback circuit involving the speed detector 43 and speed regulator 118, the rate at which the depiler table 28 is raised or lowered may be accurately controlled. Further, the position of the depiler table 28 is detected by the position detector 42 which may take the form of a shaft encoder providing either a digital or binary signal and responding incrementally to the movement of the depiler table 28. The position indicating signal derived from the detector 42 is applied to the position regulator 114 which compares the feedback, position indicating signal to the reference signal derived from the computer 110. Through the use of the feedback circuit involving the detector 42 and the position regulator 114, the position of the depiler table 28 may be accurately controlled. It is noted that the position detector 42 could illustratively take the form of a selsyn which is connected to a receiver disposed within the position regulator 114 which in turn drives a shaft encoder. Additionally, a master manual switch 122 may be connected to the speed regulator 118 to allow the operator to manually control the speed and therefore the position of the depiler table 28.

Further, the radiation detector 86 used to measure the top surface of the topmost slab member 82 is connected to and impresses a signal upon the position regulator 114 in response to the passing of the top surface of the topmost slab member 82. The position regulator 114 continues to operate the lift motors 38 for a given number of vertical position increments after the receipt of this

signal depending upon the thickness of the topmost slab member 82. The thickness of the topmost slab member 82 is indicated by the reference signal provided by the computer 110.

Due to the bowing of the slab members 82 the position regulator 114 allows the lift motors 38 to run for a period of time greater than required to lift the depiler a distance corresponding to the thickness of the next slab member 82. As a result, the bottom surface of the uppermost slab member 82 designated by the letter B is brought to a position above the level A and below the level C as shown in FIG. 2. Next as will be explained, the pushers 50 are activated to slide the topmost slab member 82 onto the table 74 without the teeth 64 striking the penultimate slab member 82 on the pile, or the topmost slab member 82 being unduly dropped upon the skids 80. Due to the position offset provided by the position regulator 114, miscalculations due to the bowing of the slab member 82 will be compensated. It is noted that an additional negative offset may be provided within the position regulator 114 due to the placement of the radiation detector 86 above the level B of the top surface of the penultimate slab member 82 in the pile. The decrease in the offset required to compensate for this factor would have a tendency to cancel the positive offset required to compensate for the bowing of the individual slab members 82.

After the topmost slab member 82 of the pile has been disposed in a position where it may be slid onto the table 74, the position detector 42 will provide a signal to the position regulator 114 to thereby stop the lift motors 38. With the topmost slab member 82 now in position, the pushers 50 are operated from a retracted position and are driven to slide the topmost slab member 82 onto the first furnace charging table 74. At this point, the computer 110 activates the pusher drive motor 58 to drive the pushers 50 to the right as shown in FIG. 2. More specifically, the signal provided by the computer 110 is applied to a pusher drive control 124. The control 124 may take the form of a voltage regulator providing an output signal in response to the command of the computer 110. The pusher drive motor 58 will be energized by the pusher drive control 124 to drive the pushers 50 through the pinion 56 from a retracted position as shown in FIG. 2 to an extended position whereby the topmost slab member 82 is slid onto the table 74.

As explained above, the motor 58 is connected by a drive shaft 63 to the limit switch 72. The switch 72 performs a first function as a pusher complete detector 72A to detect when the pushers 50 have been fully extended to depile the topmost slab member 82. The pusher complete detector 72A provides a signal to the computer 110 and also to the pusher drive control indicating the completion of the depiling step of the topmost slab member 82. The pusher drive control 124 reverses the direction of the motor 58 to thereby retract the pushers 50. The pusher drive motor 58 drives the pushers 50 through pinions 56 to the retracted position as shown in FIG. 2, at which time a pusher retract detector 72B will indicate to the computer 110 and to the pusher drive control 124 that the pushers 50 are in a retracted position. The pusher retract detector 72B may simply take the form of a cam within the limit switch 72 which will be tripped as the pushers 50 are retracted.

As seen in FIG. 4, the pusher retract detector 72B is also connected to the speed regulator 118 to prevent the lift motors 38 from being operated while the pushers 50 are in an extended position. Only after the pushers 50 have been withdrawn by the pusher drive motor 58 and the detector 72B has provided a signal to the speed regulator 118 will the speed regulator 118 be able to activate the lift motors 38. Further, a master manual control 126 may be manipulated by an operator to control the pushers 50. More specifically, a suitable signal may be applied by the control 126 through the pusher drive control 124 to operate the pushers 50 at the command of the operator.

In order to prevent the pusher assembly 48 from being operated while a slab 82 is still on the first furnace charging table 74, the detector 104 is connected to the computer 110. As explained above, the exit of a slab member 82 from the table 74 is indicated by a detector 104 which senses a beam of radiation emitted by the source 102. As the slab member 82 leaves the table 74, the leading edge of the slab member 82 breaks the beam of radiation, and after the trailing edge of the slab member 82 has passed, the beam emitted by the source 102 is re-established upon the detector 104. The re-establishment of the beam upon the detector 104, causes the detector 104 to signal the computer 110 to release the pusher drive motor 58. It is noted that the motors 78 and 92 driving respectively the first and second furnace charging tables 74 and 88 are independently controlled by the computer 110 and are activated as the furnaces 100 require a slab member 82 to be heated. Thus, the depiler 26 and the pusher assembly 48 may be operated independently of the furnace charging tables to depile or assort the pile of slab members 82. However, there is an interlock as explained above preventing the operation of the pusher assembly 48 until the detector 104 has indicated that the first furnace charging table 74 is free to receive the next slab member 82.

In brief review, the slab entry system 10 operates in the following manner: First, a pile of slab members 82 is deposited upon the slab receiving table 12. The pile of slab members 82 is received by the cradle 16 which gently lowers the pile of slab members 82 onto the rollers 18. The pile of slab members 82 is advanced by the depiler entry tables 20 and 21. When the last slab member 82 has been removed from the depiler table 28, the table 28 is positioned at the same level as the depiler entry table 21 to receive the next pile of slab members 82. Next, the depiler table 28 is lowered by the lift motors 38 until either the beam of radiation emitted by the source 84 is reestablished across the top of the pile of slabs 82 or the position detector 42 indicates that the depiler has reached its bottom-most limit. At this point, the lift motors 38 are reversed to thereby lift the depiler table 28 and the pile of slab members 82 upward until the beam of radiation sensed by the detector 86 is broken. A signal derived from the radiation detector 86 is applied to the position regulator 114 to initiate a measuring operation dependent upon the thickness of the topmost slab member 82. The position regulator 114 will continue to cause the lift motors 38 to drive the depiler table 28 upward through a distance dependent upon the thickness of the topmost slab member 82. The delay in stopping the lift motors 38 after the detector 86 has indicated the passing of the topmost slab member 82 is dependent upon a reference signal derived from the computer 110 (or operator switch 116), which in turn is dependent upon the thickness of the topmost slab member 82. The thicknesses of the slab members 82 may be provided through a series of cards which are fed into the card reader 112. After the topmost slab member 82 has been positioned so that its bottom surface, designated by the letter B in FIG. 2, is disposed between the reference levels A and C, the pusher assembly 48 is activated and the pushers 50 are driven by the motor 58 to slide the topmost slab member 82 onto the first furnace charging table 74. When the pushers 50 have reached its extended position, the detector 72A provides a signal to the computer 110 and to the pusher drive control 124 which in turn causes the pusher motor 58 to be reversed and to retract the pushers 50. When the pusher 50 have returned to their initial position as shown in FIG. 2, the detector 72B will so indicate to the computer 110, and will also stop the pusher drive motor 58.

As indicated above, the speed regulator 118 is interlocked with the detector 72B to prevent the lift motors 38 from lifting the pile of slabs 82 while the pushers 50 are in an extended position. After the pusher assembly 48 has been retracted to its initial position, the detector 72B signals the computer 110 and the speed regulator 118 to

activate the lift motors **38** which in turn lift the depiler table **38** to a new position. The top surface of the uppermost slab member **82** passes through and intercepts the beam of radiation sensed by the detector **86**. Once again this initiates a measuring operation by the position regulator **114**. Dependent upon the reference signal derived from the computer **110**, the position regulator **114** will cause the depiler table to be raised a distance corresponding to the thickness of the uppermost slab member **82** plus an offset before the lift motors **38** are stopped. After the second slab member **82** is positioned as shown in FIG. 2, the pushers **50** again will be energized to slide the next slab member **82** onto the table **74**. This operation will be repeated until each of the slab members **82** has been pushed sequentially onto the first furnace charging table **74**. It may be understood that subsequent furnace charging tables will remove the slabs one at a time and take them to one of the furnaces as they are required.

Since numerous changes may be made in the above described apparatus and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. A workpiece distribution system including first support means for receiving at least first and second workpieces, said first workpiece being disposed upon said second workpiece, second support means, drive means for positioning said first support means with respect to said second support means, control means including a digital computer having stored therein data corresponding to the finite dimension of each of said first and second workpieces, and displacement means for displacing said workpieces from said first to said second support means, said control means being operatively associated with said drive means to successively position said first and second workpieces in incremental steps in accordance with said finite dimensions stored in said digital computer so that only one of said workpieces is positioned to be displaced by said displacement means.

2. A workpiece distribution system as claimed in claim **1**, including means associated with said control means for detecting the position of said workpieces.

3. A workpiece distribution system as claimed in claim **2**, wherein said means for detecting provides a signal in response to a predetermined surface of said workpieces, said signal being applied to said control means, said control means being operative to activate said drive means in response to said control signal for a period of time sufficient to move said first support means through a distance corresponding to said dimension of said detected workpiece.

4. A workpiece distribution system as claimed in claim **1**, wherein there is included means associated with said control means and being operative for detecting the exit of said workpieces from said second support means.

5. A workpiece distribution system as claimed in claim **4**, wherein said means for detecting is associated with said control means, and said control means further includes means for preventing said means for displacing from being activated while one of said workpieces is disposed upon said second support means.

6. A workpiece distribution system as claimed in claim **1**, including sensing means associated with said control means for sensing the position of said means for displacing said control means further including means for preventing the activation of said drive means while said means for displacing is in an operative relationship with one of said workpieces.

7. The workpiece distribution system as claimed in claim **1**, further including third support means for conveying a pile of said workpieces to said first support means.

8. A workpiece distribution system as claimed in claim **7**, wherein there is further included means for detecting the top surface of the topmost workpiece of said pile, said means for detecting providing a signal to said control means, said control means operating said drive means to position said first support means so that said means for displacing operatively engages only said topmost workpiece.

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