# United States Patent

[11] **3,621,978**


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[54] **STACKING AND RETRIEVING SYSTEM AND METHOD**
**7 Claims, 9 Drawing Figs.**


[52] **U.S. Cl.** ..... **198/36,** 214/10, 114/152
[51] **Int. Cl.** ..... **B65g 61/00**
[50] **Field of Search** ..... 214/10, 152; 198/36



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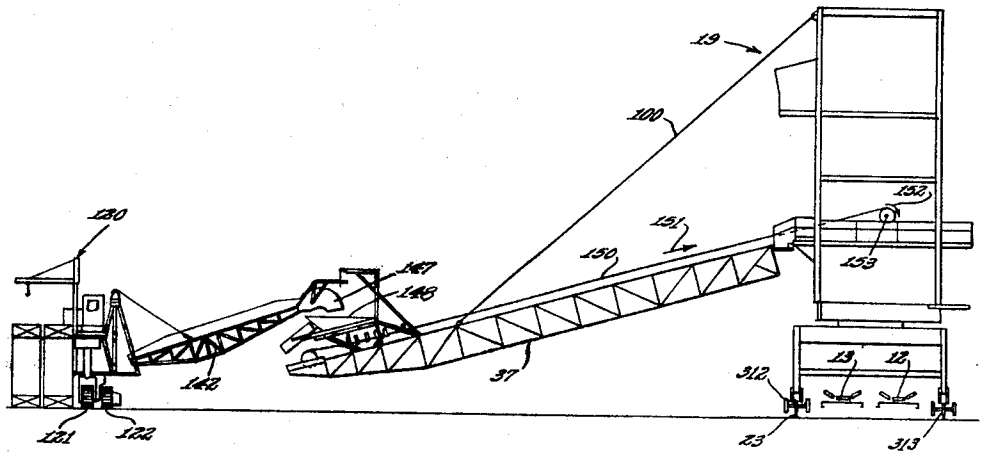
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**ABSTRACT:** A stacking and retrieving system for stockpiles of material wherein a self-propelled retrieving machine cooperates with the self-propelled stacker in retrieving material, the speed of the stacker being controlled to conform to that of the retrieving machine, while steering of the retrieving machine is controlled for movement parallel to the path of the stacker.

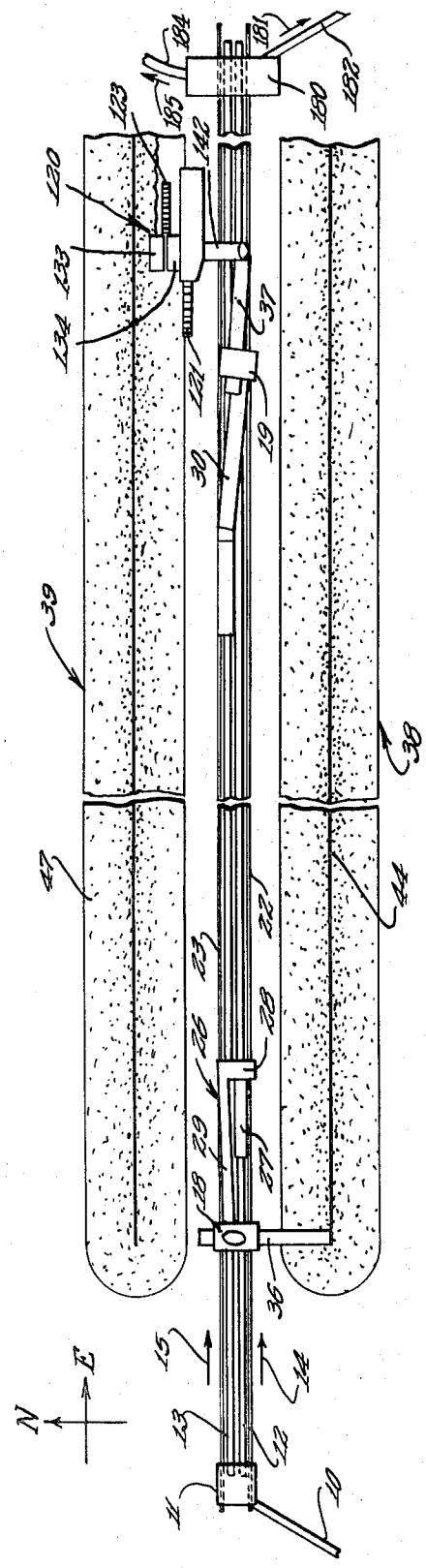


FIG. 1

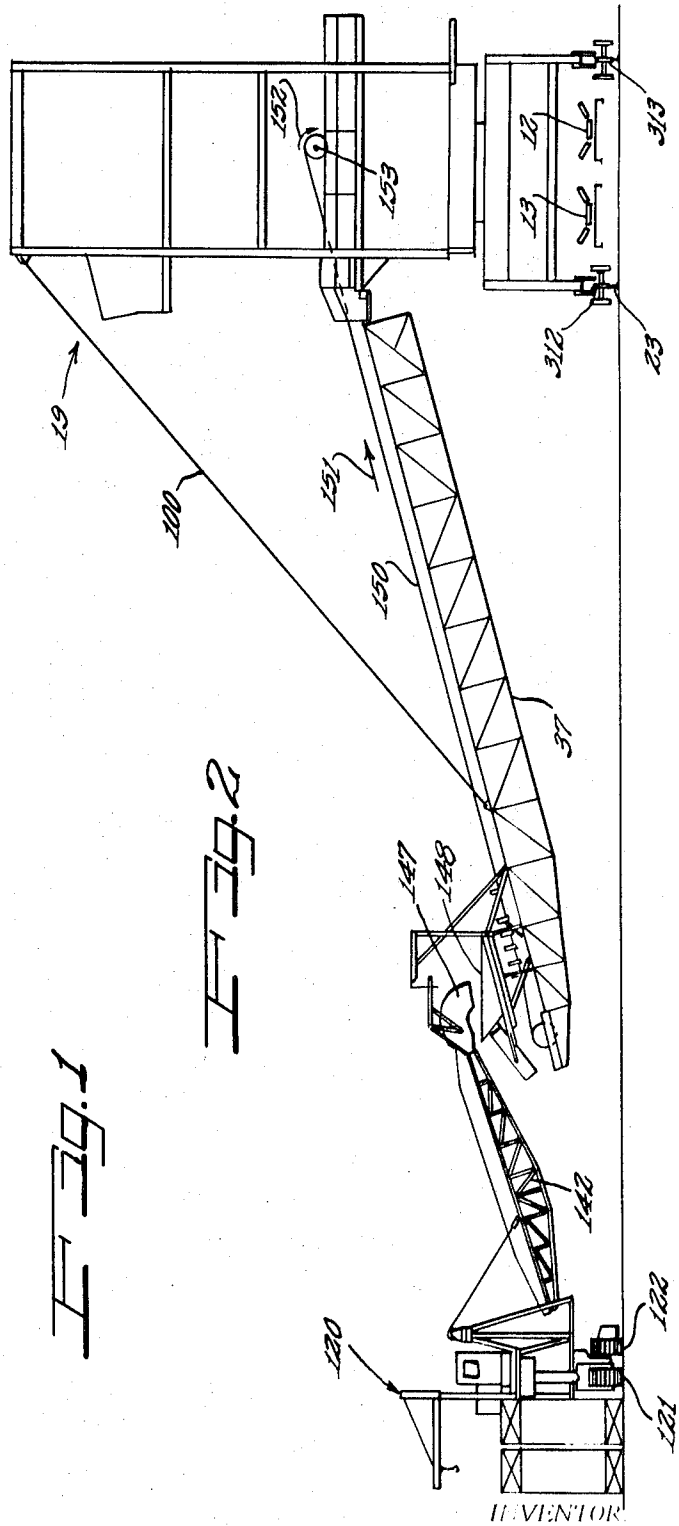


FIG. 2

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FIG. 3

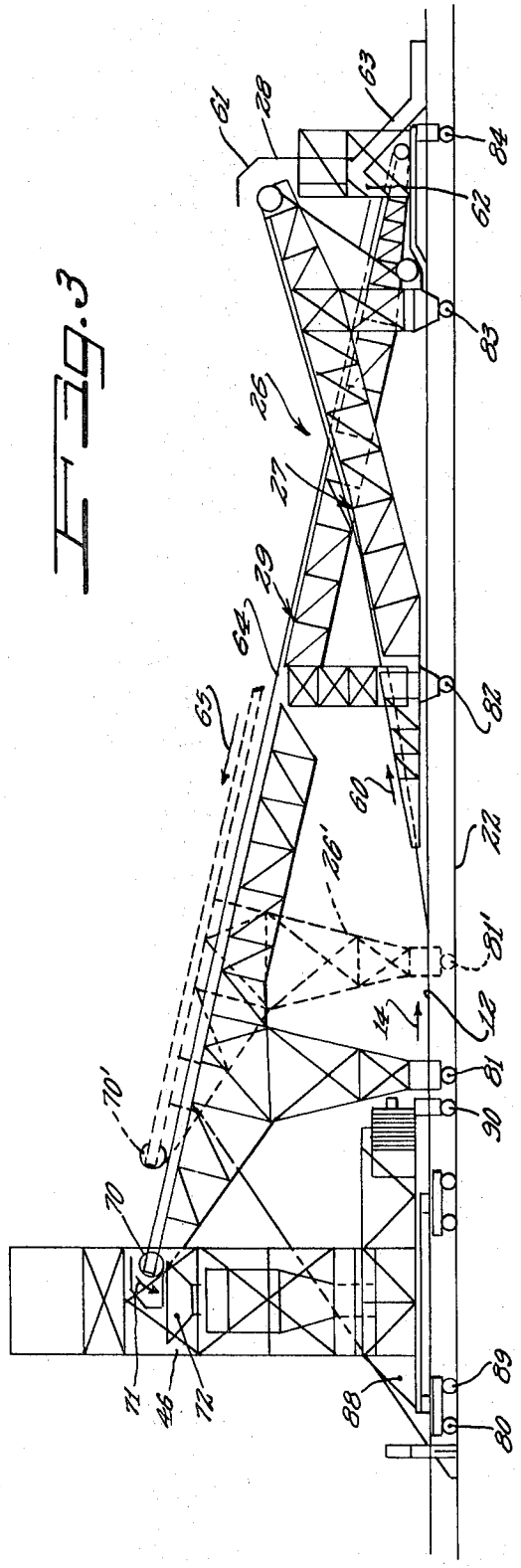
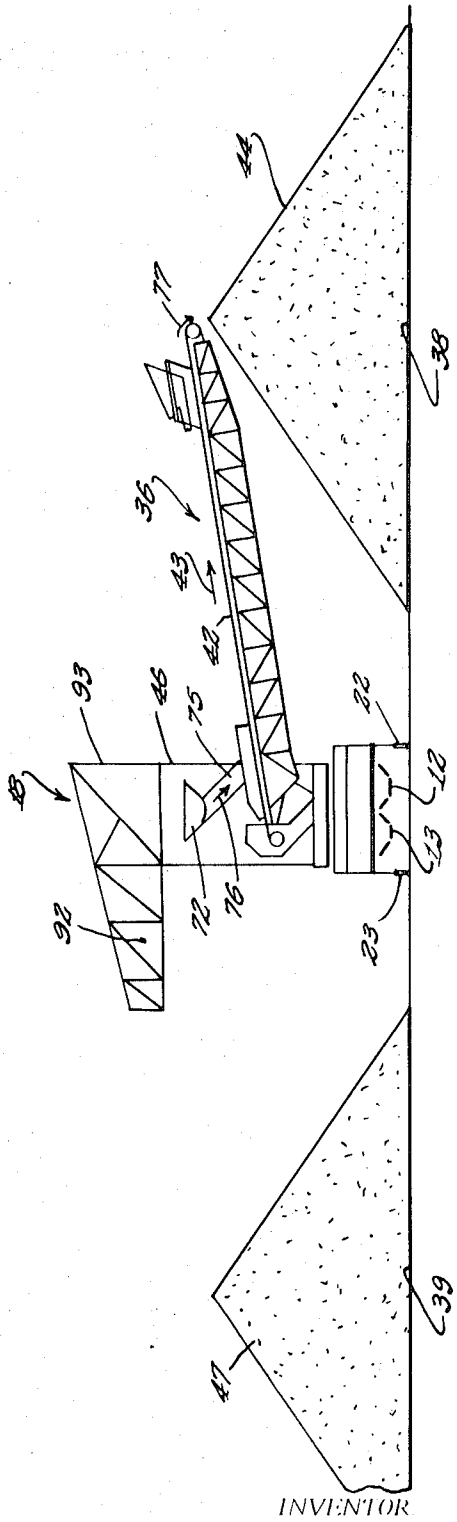


FIG. 4



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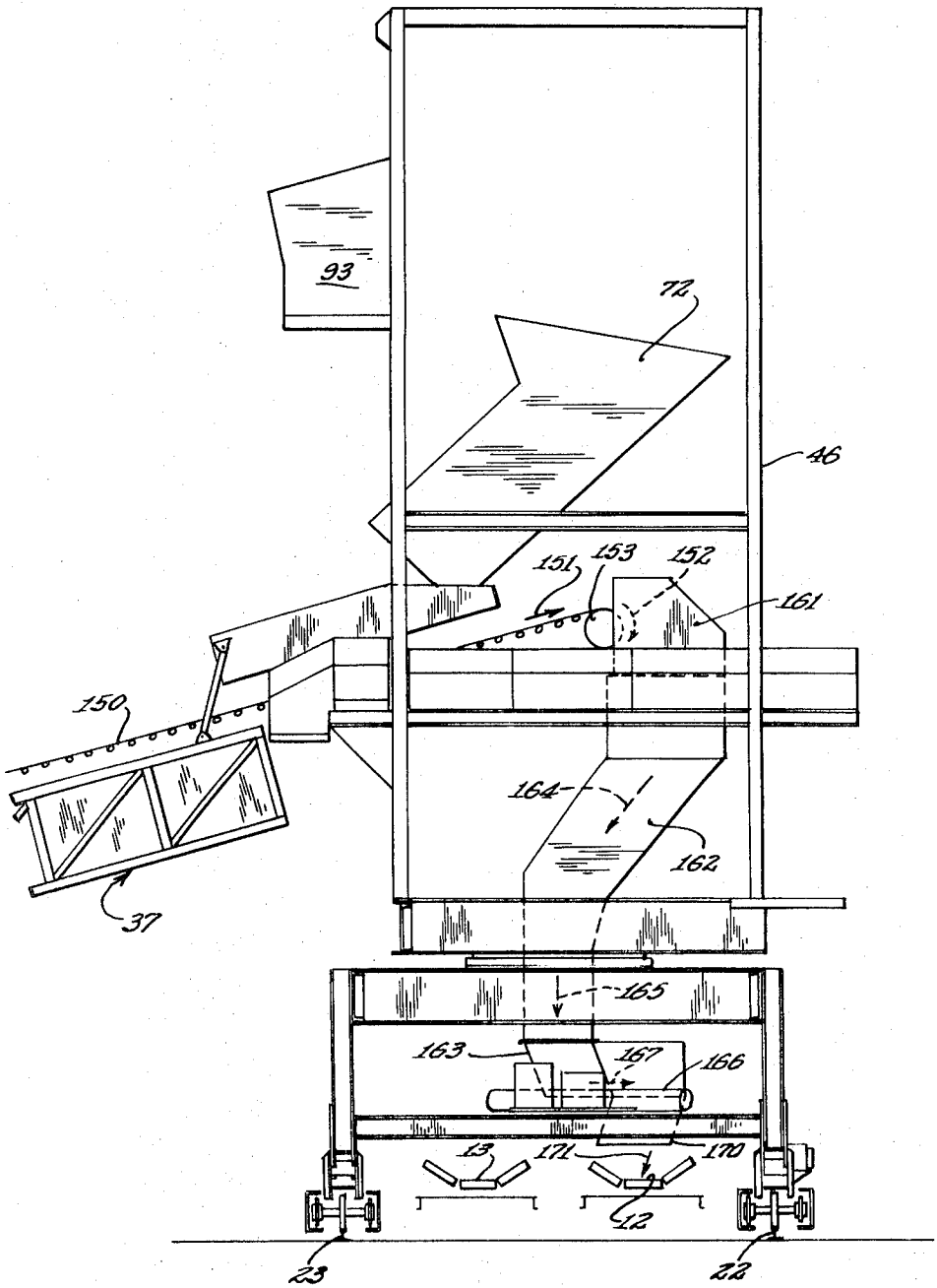



Fig. 5

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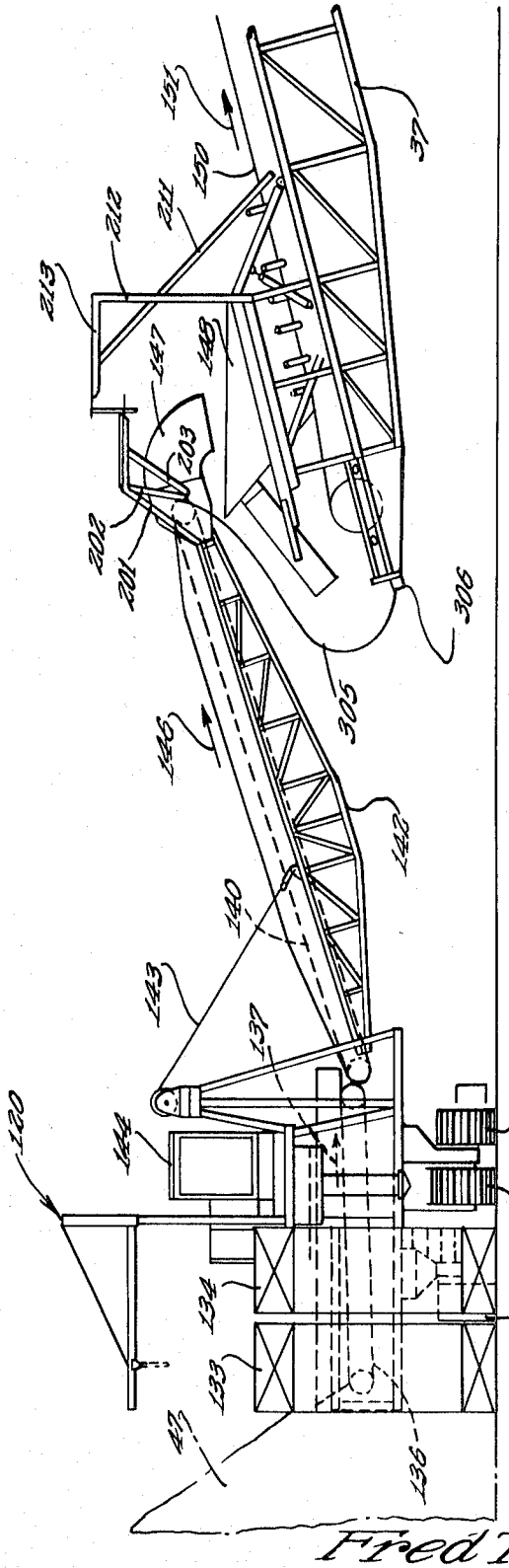


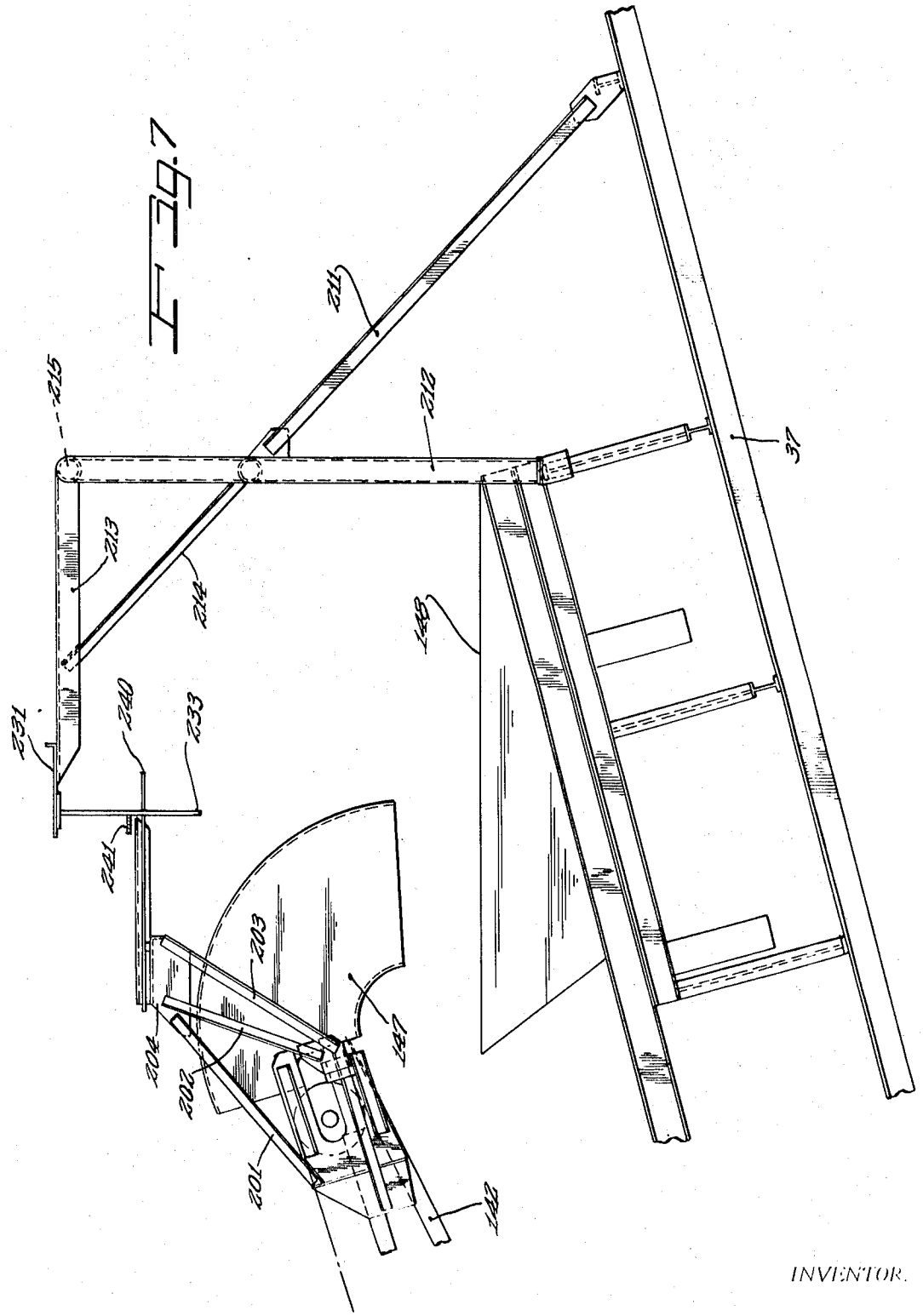

FIG. 6

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FIG. 7




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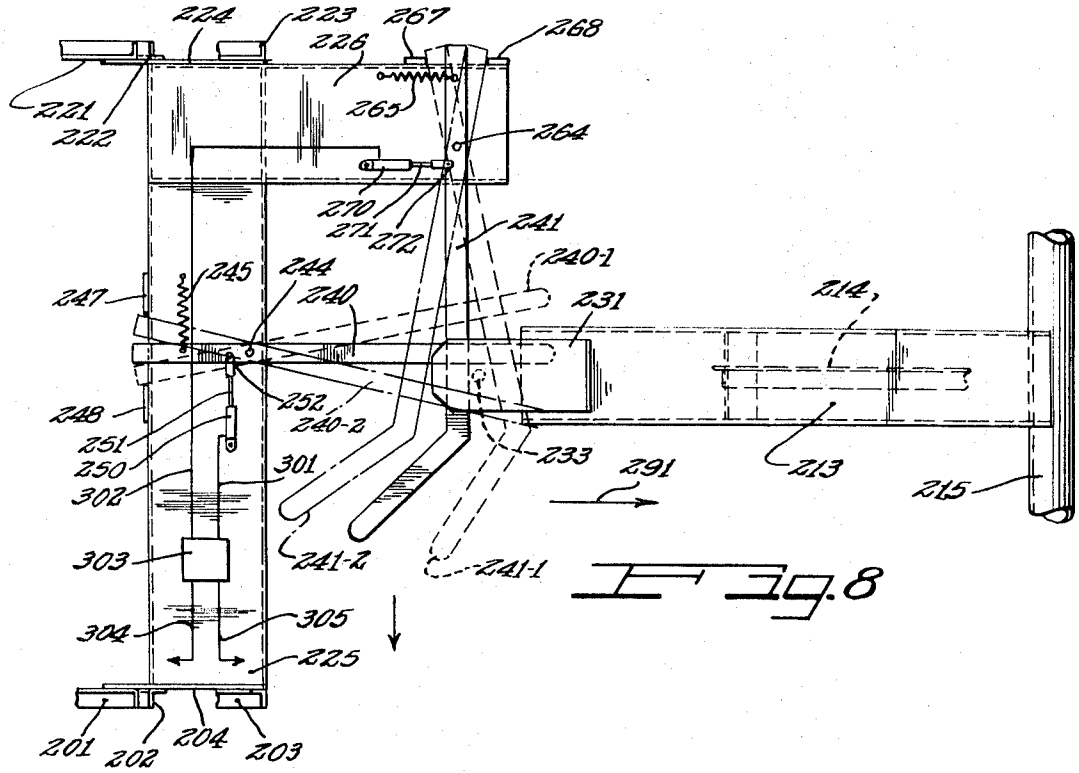



Fig. 8

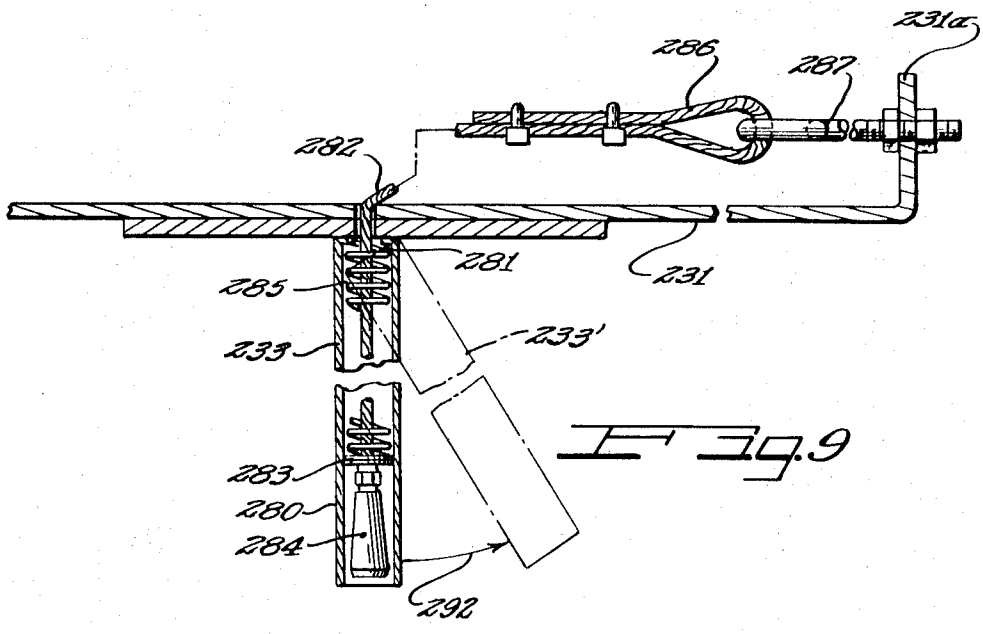



Fig. 9

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# STACKING AND RETRIEVING SYSTEM AND METHOD

## SUMMARY OF THE INVENTION

This invention relates to a stacking and retrieving system and method and particularly to a retrieving system and method utilizing the stacker which initially produces the stockpile as a part of the retrieving system along with a separate self-propelled retrieving machine.

An object of the invention is to provide a stacking and retrieving system and method providing improved efficiency.

A further object of the present invention is to provide an improved apparatus and method for retrieving material from stockpiles or the like.

A particular feature of the present invention resides in the provision of a stacking and retrieving system which utilizes a separable retrieving machine such as a multiwheeled self-propelled material-handling machine, whereby a stacker with a relatively lightweight boom is operable independently of the material-handling machine during transfer of material to a stockpile, but is operatively associated with such machine for retrieving material from the stockpile with optimum speed and efficiency. The material-handling machine can be a relatively heavy piece of equipment with multiple relatively rigid material retrieving wheels for very fast and efficient retrieving of material as the machine moves longitudinally of the stockpile at a steady speed.

Other objects, features and advantages of the invention will be readily apparent from the following description of a certain preferred embodiment thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary somewhat diagrammatic plan view of a stacking and retrieving system in accordance with the present invention;

FIG. 2 is a schematic side elevational view of the system of FIG. 1 showing a retrieving machine and stacker in cooperating relationship during a material retrieving operation;

FIG. 3 is a somewhat diagrammatic partial elevational view illustrating the system of the present invention operating in stacking mode;

FIG. 4 is a somewhat diagrammatic transverse sectional view showing the stacker of FIG. 3 operating in the stacking mode;

FIG. 5 is an enlarged partial side elevational view showing further details of the stacker system of the present invention with the stacker operating to retrieve material from a stockpile;

FIG. 6 is an enlarged partial somewhat diagrammatic side elevational view showing further details of the system of FIG. 1 operating in retrieving mode;

FIG. 7 is a further enlarged partial side elevational view showing the cooperating probe devices of the retrieving machine and stacker of the system of FIG. 1;

FIG. 8 is an enlarged diagrammatic partial plan view illustrating the operation of the probe structure of FIG. 7; and

FIG. 9 is an enlarged partial sectional view showing certain details of construction of the vertical probe structure carried by the stacker in the illustrated system.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates an overall view of a stacking and reclaiming system in accordance with the present invention wherein an overland conveyor 10 supplies material to the system from a source of supply, such as a coal mining operation. A conventional transfer tower 11 may receive material from the conveyor 10 and deliver it selectively to one of two belt line conveyors 12 and 13 which serve to convey the material in the direction indicated by arrows 14 and 15. The material carried by conveyor 12 may be supplied to a self-propelled stacker 18, while the material carried by the conveyor 13 may be supplied to a stacker indicated at 19.



The stackers 18 and 19 may be of identical construction and may operate along common longitudinal rails indicated at 22 and 23. The stacker 18 is illustrated as having an elevator conveyor assembly 26 associated therewith including a tripper section 27, a transfer section 28 and an elevator conveyor section 29. Each of the stackers is provided with a boom conveyor structure, the boom of stacker 18 being indicated at 36, and the boom of stacker 19 being indicated at 37.

For transferring material from the belt line conveyors 12 and 13 to stockpile regions such as indicated at 38 and 39, the boom of the stacker 18 or 19 is held in a relatively elevated position as indicated in FIG. 4 for boom 36. The boom conveyor such as indicated at 42 then operates in the direction of arrow 43 to deposit material centrally of the stockpile region 38 so as to produce a stockpile such as indicated at 44 in FIG. 4. By rotating the tower 46 of stacker 18 through 180°, the boom conveyor 42 may supply material to stockpile region 39 so as to build up a stockpile as indicated at 47 in FIG. 4.

The stacker 19 being identical to the stacker 18 may perform the same functions as illustrated in FIG. 4. Since the stackers 18 and 19 and conveyor assemblies 26 and 30 may be identical, in general only one will be described specifically herein, and it will be understood that such description will also be applicable to the other identical component.

Referring to FIG. 3, it will be observed that material moving in the direction of arrow 14 on conveyor 12 is removed from the conveyor 12 by means of the tripper section 27 whose tripper conveyor is operating in the direction of arrow 60. Material discharged by the tripper conveyor into a chute 61 of transfer section 28. From the chute 61, the material can be delivered to a branching chute 62 or 63. The chute 62 supplies the material to elevator conveyor 64 of conveyor section 29 which operates in the direction of arrow 65. Alternatively, the material may be returned to conveyor 12 via chute 63. The tail pulley of conveyor 64 is indicated at 70 and material is discharged from conveyor 64 as indicated by arrow 71 so as to be supplied to a hopper 72, also seen in FIG. 4. The material flows from the hopper 72 to a delivery chute 75, FIG. 4, so as to be supplied as indicated by arrow 76 to the boom conveyor 42, FIG. 4, operating in the direction of arrow 43. The discharge of material from the end of the boom material is indicated by arrow 77.

Referring to FIG. 3, it will be observed that the stacker 18 is supported on the rails such as 22 by means of wheels such as indicated at 80. The elevator conveyor assembly 26 is similarly supported by means of wheels such as indicated at 81–84 so as to be movable with the stacker 18 as the stacker moves along the length of the stockpile regions 38 and 39, FIG. 1, to distribute material to one of the stockpiles such as stockpiles 44 indicated in FIG. 4. When the stacker is to operate in a reclaiming mode, the elevator conveyor assembly 26 may be shifted to the position indicated in dash outline at 26' in FIG. 3, the corresponding location of tail pulley 70 being indicated at 70', and the corresponding position of wheel 81 being indicated at 81'. In the detached position 26', the transfer section 28 may receive material from the tripper 27 and supply it to the chute 63, so that material is simply picked up from conveyor 12 at location 86 and deposited on the conveyor again at a location such as indicated at 87 in FIG. 3. FIG. 4 may be considered as a view of the stacker 18 with the elevator assembly 26 disengaged therefrom. During stacking mode, the conveyor assembly 26 may be secured for joint movement with the stacker 18 in either direction of movement of the stacker along the rails 22 and 23, the conveyor assembly being driven along the rails 22 and 23 by means of the propulsion mechanism for the stacker 18. The stacker-propelling hydraulic power pack is located generally at the region 88 and includes a drive for driving the wheel 89 and also the wheel 90 of the stacker. The stacker may also be provided with a boom hoist drive located generally in the region 92, FIG. 4. The operator's cab may be located at the region indicated at 93 in FIG. 4 so as to face in the direction of extension of the boom 36.

By way of example, in one installation, stacker 18 was operative to stock a south stockpile such as 44 or a north stockpile such as 47 over the entire length thereof from the extreme west boundary (at the left as viewed in FIG. 1) to within 400 feet of the extreme east boundary (at the right as viewed in FIG. 1). Similarly the stacker such as indicated at 19 was selectively operable to stock the stockpiles 44 and 47 over the length thereof extending from the extreme east boundary to within 400 feet of the extreme west boundary of the stockpiles. Suitable limit switches or the like are provided to insure against collision, but this forms no part of the present invention and is not illustrated herein, the provision of such means being well within the skill of the art.

Referring to FIG. 4, it will be understood that the boom 36 is pivotally mounted at the stacker 18 so as to enable the discharge end thereof at 77 to be raised or lowered by means of a cable comparable to the cable indicated at 100 for the stacker 19 in FIG. 2. Conventional hoist means is, of course, provided for raising and lowering the boom of each stacker, and also for rotating the boom-supporting tower such as 46, FIG. 4, about a central vertical axis. All such means as well as the detailed construction and control of the various conveyors, chutes, and the like form no part of the present invention, and are obviously fully within the skill of the art.

The stackers 18 and 19 are each capable of cooperating with a material-handling machine generally indicated at 120, FIG. 2, in reclaiming material from the stockpiles 44 and 47 over the previously mentioned operating ranges thereof. The stacker 19 has been illustrated in FIGS. 1 and 2 as cooperating with the material-handling machine 120 for reclaiming material from the stockpile 47, by way of example. The material handling machine 120 is a self-propelled machine for example having a three point suspension of caterpillar-type treads including a forward steerable tread 121 and a pair of rear treads 122 and 123 (FIG. 6.) The machine is shown as including two relatively rigid material retrieving or digging wheels 133 and 134 which are driven by the power plant of the machine 120 so as to scoop up material from the stockpile and to supply the same to an internal conveyor 136 extending transversely into the digging wheels 133 and 134 and operating to move material in the direction of arrow 137 onto a second or reclaimer conveyor 140 which is carried by a reclaimer boom 142. The boom 142 is pivotally carried by the machine 120, and its height may be controlled by means of a cable 143. The operator cab for the machine may be located at 144 so that the operator can view the progress of the machine along the stockpile and steer the machine 120 so that it moves substantially parallel to the rails 22 and 23 along which the stacker 19 moves. Reclaimed material is moved by the conveyor 140 in the direction of arrow 146 to a discharge chute or region 147 which is maintained in alignment with a receiving chute or region 148 carried on the boom 37. In this mode of operation, the stacker boom conveyor 150 similar to conveyor 42 operates in the direction of arrow 151 so as to move material from the receiving chute 148 to a discharge region or point indicated by an arrow 152 adjacent a tail pulley 153 of the conveyor. In FIG. 1, it will be observed that the stacker boom 37 may be swung about a vertical axis so as to accommodate different spacings between the reclaimer 120 and stacker 19 as the reclaimer makes successive passes along the length of the stockpiles such as 47.

Referring to FIG. 5, an arrangement of material transfer chutes 161–163 serves to convey material as indicated by arrows 164 and 165 to a cross feed conveyor 166 and moving material in the direction of arrow 167. A material discharge chute 170 then serves to direct material as indicated by arrow 171 on to the conveyor 12 which then transports the material to the east transfer station 180. From the transfer station 180 material may be moved in the direction of arrow 181 via a conveyor 182 which in a particular installation led to a barge loading dock. In the actual installation, a further conveyor 184 was provided for conveying material from the transfer station 180 in the direction of arrow 185. The further details of the stacker 19 may be similar to those illustrated for the stacker 18, and of course, the stacker 18 would also be provided with the components illustrated in FIG. 5 for the stacker 19. The reversible drive for the stacker boom conveyors and other details are, of course, well within the skill of those skilled in the present art.

Referring to FIG. 6, it will be observed that the boom 142 of the reclaiming machine 120 has at the end thereof a series of frame members 201–204 which are integral with the frame of the boom 142. Similarly the boom 37 of the stacker 19 carries certain frame members such as indicated at 211–215 integral therewith. The members 201–204 together with similar members 221–224, FIG. 8, on the opposite side of the reclaimer boom 142, FIG. 7, mounting horizontally extending members 225 and 226, FIG. 8. As seen in FIG. 7, the frame members 211–215 of the stacker boom 37 mount a horizontal plate 231 which in turn carries a substantially vertically disposed probe means 233. As best seen in FIG. 8, cooperating probe means carried on the reclaimer parts 225 and 226 comprise a longitudinal error-sensing arm 240 and a transverse error-sensing arm 241.

The sensing arm 240 is pivotally mounted at 244 on the horizontal member 225 and is spring urged in the clockwise direction as viewed in FIG. 8 by means of a tension spring 245, so that the arm 240 will be held in engagement with the probe 233 over the operating range of positions of the sensing arm 240 as determined by stop bars 247 and 248, FIG. 8. Thus the sensing arm 240 is capable of a range of pivotal movement from the extreme counterclockwise position indicated at 240–1 in dash outline in FIG. 8 to the extreme clockwise position indicated in dot dash outline at 240–2 in FIG. 8. For sensing the angular movement of the sensing arm 240 as it follows the position of the probe 233 within its operating range, a transducer device 250 is provided having a movable rod 251 thereof pivotally connected at 252 with a suitable point on the sensing arm 240. By way of example, the point of connection may be such relative to the pivot point 244 that the rod 251 reciprocates over a range of plus or minus 0.5 inch from the central position of the sensing arm 240 shown in solid outline in FIG. 8. Any suitable transducer device may be utilized, for example a transducer for supplying an electric signal whose polarity is positive or minus depending on the direction of the error from the central position of the sensing arm 240 and providing an electric potential whose magnitude is a function of the amount of displacement of the rod 251 from its central position which is actually shown in FIG. 8.

Similarly the transverse sensing arm 241 is pivotally mounted at 264 and is spring urged by means of tension spring 265 in the counterclockwise direction as viewed in FIG. 8 so as to maintain the sensing arm 241 in engagement with the probe 233 over the operating range of positions of the sensing arm 241 between stop members 267 and 268. The extreme counterclockwise position of sensing arm 241 is indicated at 241–1 in dash outline, while the extreme clockwise position of the sensing arm 241 is indicated at 241–2 in dot dash outline. A transducer 270 is provided having its rod 271 pivotally connected at 272 with the sensing arm 241 so that the transducer 270 supplies any desired error signal such as the electrical error signal described with reference to the transducer 250.

FIG. 9 illustrates the details of probe means 233, from which it will be noted that the probe means 233 comprises a tube 280 having an integral end wall 281 with an aperture therein through which a cable 282 freely extends. The cable 282 has washer means 283 retained at the end thereof by means of a fitting 284 which is fixedly secured to the end of the cable. A compression spring 285 is sitted at its upper end against the end wall 281 and acts against the washer means 283 to urge the washer means downwardly and thus to maintain the cable 282 taut, the opposite end of the cable at 286 being fixedly secured by means of a fastener 287 to an integral leg 231*a* of the plate 231.

The fastening means 287 is so adjusted that the spring 285 is under a substantial compression such as to relatively strongly

resist deflection of the rod **233** from its vertical orientation illustrated in FIG. **9**. Thus, the force of the tension springs **245** and **265** is insufficient to deflect the probe **233** from its vertical orientation, and the transducers **250** and **270** will accurately reflect the relationship between the stacker and reclaimer so long as the sensing arms **240** and **241** remain within their operating range as illustrated in FIG. **8**. If however the reclaimer is advanced in the longitudinal direction indicated by arrow **290** so that the sensing arm **240** is moved in the counterclockwise direction against the stop **248**, and the reclaimer continues to advance relative to the stacker, the probe **233** will deflect out of its vertical orientation against the action of spring **285** to a sufficient extent to allow the sensing arm **240** to move past the location of the probe **233**. Similarly if the reclaiming machine should move toward the stacker in the transverse direction indicated by arrow **291**, the probe means **233** would be deflected in the direction of arrow **292** in FIG. **9** and would not be damaged by overtravel of the reclaimer toward the stacker. The manner in which the probe **233** pivots to yield is indicated in dash outline at **233'**, FIG. **9**.

The specific electric circuitry utilized in conjunction with the transducers **250** and **270** forms no part of the present invention and is entirely within the skill of workers in the relevant art. Electrical cables are indicated at **301** and **302** leading from the transducers **250** and **270** to a suitable error signal transmission circuit **303** which has an output cable at **304** leading via the boom **142** to the control cab **144** of the reclaimer. Simply by way of example, at the control cab, the longitudinal and transverse errors sensed by the transducers **250** and **270** may be visually displayed so that the operator of the reclaiming machine can steer the reclaimer so as to maintain an essentially minimum transverse error in the relationship between the reclaimer and stacker, that is, maintaining a position of the sensing arm **241** relative to the probe means **233** as represented by the solid outline position of the sensing arm **241** in FIG. **8**. Similarly, any longitudinal error may be transmitted by means of a cable **305** to the control cab of the stacker **19** so as to enable the operator of the stacker to maintain any longitudinal error at a minimum, that is to maintain the probe **233** in the position illustrated in FIG. **8** relative to the central position of the sensing arm shown in solid outline at **240** in FIG. **8**. The remote indicators may simply take the form of movable pointers which move over relatively substantial distances in opposite directions from a central zero error position. In FIG. **6**, cable **305** has been indicated diagrammatically as including a plug element at **306** for detachable engagement with a receptacle on the boom **37**, the boom **37** then having suitable cable means for transmitting the longitudinal error signal to the cab of the stacker.

Of course, it is well within the skill of the art to provide automatic electric-hydraulic controls so that the speed of the stacker **19** is automatically controlled to maintain a substantially zero longitudinal error from transducer **250**, and similar automatic controls can readily be applied to the steering from the material handling machine **120** so as to maintain a minimum transverse error signal from the transducer **270**. Simply by way of example, such controls are available from the Minneapolis-Honeywell Company. Typical transducers supplied by Minneapolis-Honeywell Company are identified as LVDT transducers. The material-handling machine **120** may conform with a two wheel excavator machine disclosed in my copending U.S. Pat. application entitled "Multi-Wheeled Material Handling Device," U.S. Ser. No. 668,064, filed Sept. 15, 1967 which issued on Mar. 17, 1970 as U.S. Pat. No. 3,500,563.

## SUMMARY OF OPERATION

In carrying out a reclaiming operation, the material-handling machine **120** is moved under manual control to the beginning of a longitudinal pass along the length of a stockpile such as **47**, FIG. **1**. A stacker such as indicated at **19** is positioned adjacent the material-handling machine **120** with the stacker boom **37** lowered and its material-receiving hopper **148** positioned beneath the discharge **147** of the reclaimer boom **142**. As illustrated in FIG. **1**, when the stacker **19** and reclaimer **130** are relatively close, the boom **37** is swung so as to extend behind the stacker at an acute angle to the direction of rails **22** and **23**. At each successive pass of the material-retrieving machine **120**, the machine is moved further in the transverse direction from the stacker **19**, and the boom **37** is swung toward the machine **120** to maintain the operating relationship thereof as illustrated in FIG. **2**. As seen in FIGS. **2** and **6** the material-retrieving machine **120** is moved into a position such that its longitudinal sensing arm **240** is in contact with the vertically depending probe or reference member **233**, with the sensing arm **240** disposed substantially at its central zero error position shown in solid outline in FIG. **8**. Similarly, the boom **37** is fixed at an angle such that the transverse error-sensing arm **241** is in engagement with the probe **233**, FIG. **8**, and is maintained thereby in the central zero error position.

As the material-retrieving machine **120** starts to move down the stockpile **47**, the physical movement of the hand control within the cab of the retrieving machine may signal the hydrostatic transmission of the stacker **19** to move ahead at approximately the same speed as the reclaimer. The cable **305**, FIG. **2**, may include suitable electrical conductors for carrying out this function, or the stacker may be simply controlled by an operator in its cab to startup at the same time as the retrieving machine. The hydrostatic transmission of the stacker **19** would be driving the stacker wheels such as those indicated at **312** and **313**, FIG. **2**. If the retrieving machine **120** starts to move ahead a little faster than the stacker, then the transducer **250**, FIG. **8**, is displaced to produce a longitudinal error signal of magnitude and polarity in accordance with such error. This error may be utilized for manual or automatic correction as previously described so as to correspondingly increase the speed of the hydrostatic transmission on the stacker. As the stacker speed matches the speed of the retrieving machine, the transducer **250** would return to its neutral or zero error position as shown in FIG. **8**, and the new stacker speed would be the same as the speed of the retrieving machine. In steering if the retrieving machine gets too close to the stacker, the sensing arm **241** would be rotated in the clockwise direction to produce a transverse error signal from the transducer **270** of magnitude and polarity in accordance with the error. The steering cylinders of the retrieving machine would then be actuated either manually or automatically to direct the front crawler **121**, FIG. **2**, of the retrieving machine **120** so as to steer the machine away from the stacker until the proper distance therebetween is reestablished. At the proper transverse distance, the transducer **270** returns to the zero error position shown in FIG. **8**, and the material retrieving machine is then moving parallel to the tracks **22**, **23**, FIG. **2** on which the stacker travels. Thus, the stacker **19** is slaved to the retrieving machine **120** so far as speed of motion is concerned, and the retrieving machine **120** is slaved to the stacker so as to maintain a predetermined distance therebetween, the steering of the retrieving machine being controlled to maintain the predetermined distance. The result is that during a reclaiming pass, material picked up by the wheels **133**, **134**, FIG. **2**, is transported as indicated by arrows **138**, **146** and **314** into the central portion of the receiving hopper **148**, FIG. **2**, at the end of the stacker boom **37**. From there, the material is transported by the stacker conveyor **42** as indicated by arrows **151** and **152**, FIG. **2**, the material being delivered to chutes **161–163** on the stacker, FIG. **5**, as indicated by arrows **164** and **165**, and then being fed horizontally by means of the feed conveyor **166** to a discharge chute **170** whereupon the material is delivered as indicated by arrow **171** onto the longitudinal conveyor **12**. The conveyor **12** may be of the endless type with its active run moving from left to right as viewed in FIG. **1** as to deliver the material to a transfer tower **180** from which the material may travel in the direction of arrow **181** along a conveyor system **182** for delivery of the material to barges or other transportation means.

The arms **240** and **241** of the probe means measure the amount and direction of relative displacement between the position of alignment of the discharge region **147** and receiving region **148** and the transducers **250** and **270** respectively generate the error signal in response to the measured displacement. The coaction between the arms **240, 241** along with the transducer and the probe **233** provide a position-indicating means for determining the relative displacement of the machine **120** and stacker **19** from a predetermined relative position in which the discharge and receiving regions are in alignment for transfer of material.

While the operation has been discussed with the direction of the reclaimer or material-handling device **120** being varied with respect to the stacker **19**, and the speed of the stacker being a slave to the speed of the reclaimer, the speed and direction of the reclaimer **120** could be varied in response to the error signals so that the movement of the reclaimer was a slave to the stacker. Furthermore, the stacker could be a slave to the reclaimer for both longitudinal and transverse error by varying its speed and the angular position of the boom **42** in response to the error signals.

I claim as my invention:

**1.** The method of retrieving material from a stockpile to which it has been supplied by means of a stacker system including a conveyor extending along the length of the stockpile, and an associated self-propelled stacker movable along the conveyor to distribute material from successive points along the length of the conveyor to corresponding successive points along the length of the stockpile, said method comprising

driving a self-propelled material-retrieving machine longitudinally of the stockpile to retrieve material therefrom,

moving the stacker along said conveyor and mechanically conveying material from the retrieving machine to the stacker for deposition thereby onto said conveyor, and

controlling the speed of movement of the stacker so as to be slaved to longitudinal movement of the retrieving machine and to move in step therewith, and controlling steering of the retrieving machine so as to be slaved to the path of the stacker along said conveyor, to maintain substantially a material-receiving relationship of the stacker to the retrieving machine during movement thereof along the stockpile, thereby to transfer material from successive points along the length of the stockpile to corresponding successive points along the length of said conveyor.

**2.** Apparatus for handling material comprising a self-propelled material-handling device including means for gathering material and a conveyor means for receiving the material and conveying the material to a discharge region;

a conveyor device including a material-receiving region, conveying means to transport the material from said receiving region to a discharge point, means for moving the material receiving region to be in alignment with the discharge region for receiving material therefrom as the material-handling device moves and gathers material; and

a position indicating means having a reference member mounted on one of said devices, and displacement-measuring means mounted on the other device operably engaging said reference member for measuring the relative displacement of said regions from a position of alignment, said measuring means including means for generating an error signal for the relative displacement to indicate the amount and direction of the relative displacement between said regions from said position of alignment so that the speed and direction of movement of the devices can be adjusted to return the regions into alignment.

**3.** Apparatus for reclaiming material from a stockpile comprising;

a self-propelled reclaimer having conveyor means for supplying material reclaimed thereby to a material discharge region;

a self-propelled stacker movable along a fixed longitudinal path offset from the stockpile during a reclaiming pass, said stacker having a longitudinal conveyor extending for the length of the stockpile, said stacker having material transfer means movably mounted therealong with an inlet for disposition in operative relationship with the conveyor means of the reclaimer to receive material from the discharge region thereof and having an outlet for discharge of material to the longitudinal conveyor, thereby to transfer the material continuously during a reclaiming pass from the stockpile to the longitudinal conveyor via the material transfer means of the stacker, and

probe means carried by the stacker and the reclaimer and coacting to mechanically define a predetermined cooperating relationship between the stacker and reclaimer wherein the discharge region of the reclaimer is centered relative to the inlet of material transfer means, said probe means sensing relative displacement of the discharge region from a center position with respect to the inlet and providing an error signal for both longitudinal and transverse displacement from the center portion with said error signal indicating necessary corrections in the speed of the reclaimer and the stacker to correct for any longitudinal displacement and changes in the direction of movement of the reclaimer and positioning of the material transfer means to correct for any transverse displacement.

**4.** Apparatus according to claim **3** with one of said probe means comprising a transverse movement sensing arm movable in response to relative transverse movement of the reclaimer and stacker, and a transducer coupled to the sensing arm and responsive to movement thereof to generate a transverse error signal.

**5.** Apparatus according to claim **3** with one of said probe means comprising a longitudinal movement sensing arm movable in response to relative longitudinal movement of the reclaimer and stacker, and a transducer coupled to the sensing arm and responsive to movement thereof to generate a longitudinal error signal.

**6.** Apparatus according to claim **3** with one of said probe means comprising a transverse movement sensing arm movable in response to relative transverse movement of the reclaimer and stacker, a transducer coupled to the transverse movement sensing arm and responsive to movement thereof to generate a transverse error signal, and a longitudinal movement-sensing arm movable in response to relative longitudinal movement of the reclaimer and stacker, and a transducer coupled to the longitudinal movement-sensing arm and responsive to movement thereof to generate a longitudinal error signal, and the other of said probe means comprising a reference member disposed generally vertically and retained in the vertical disposition with substantial force, the sensing arms being mounted for pivotal movement in generally horizontal planes, and spring means urging said arms to engage the generally vertically disposed reference member, the spring means exerting a lesser force on the sensing arms than said substantial force so that the vertically extending reference member maintains its generally vertical disposition in actuating said sensing arms over a predetermined range of angular positions of the sensing arms.

**7.** Apparatus according to claim **6** wherein further spring means retains the generally vertically disposed reference member in generally vertical orientation but accommodates disengagement of the vertically disposed reference member from the sensing arms when the sensing arms reach the limit of their angular movement.

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