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Warren

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[54] **VARIABLE SPEED BI-DIRECTIONAL CONTROL MECHANISM**

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[73] Assignee: **United States Steel Corporation**, Pittsburgh, Pa.

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[21] Appl. No.: **233,176.**

[52] **U.S. Cl.** **307/149,**

[51] **Int. Cl.** **H02j 1/00,**

[58] **Field of Search** ..... 318/39; 29/64; 74/555, 56; 90/21 R; 82/22; 212/21; 307/149,

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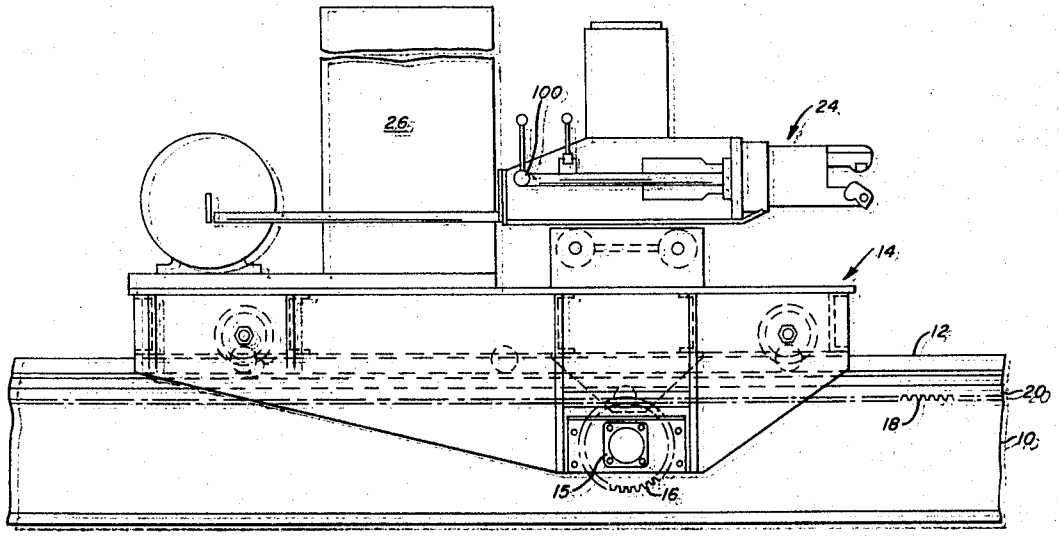
Primary Examiner—Herman J. Hohauser

Attorney—Ralph H. Dougherty

[57] **ABSTRACT**

A variable speed bi-directional control mechanism for a longitudinally movable carriage. A shaft rotatable by a handle has a centering or dead-man control, means selected by the direction of rotation of the shaft for determining the direction of movement of the carriage and means for controlling the speed of movement of the carriage. The speed of movement is determined by the amount of rotation of the shaft. The mechanism is advantageously employed in apparatus for manipulating a rail through a straightening machine.

5 Claims, 5 Drawing Figures



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SHEET 1 OF 3

FIG. 1

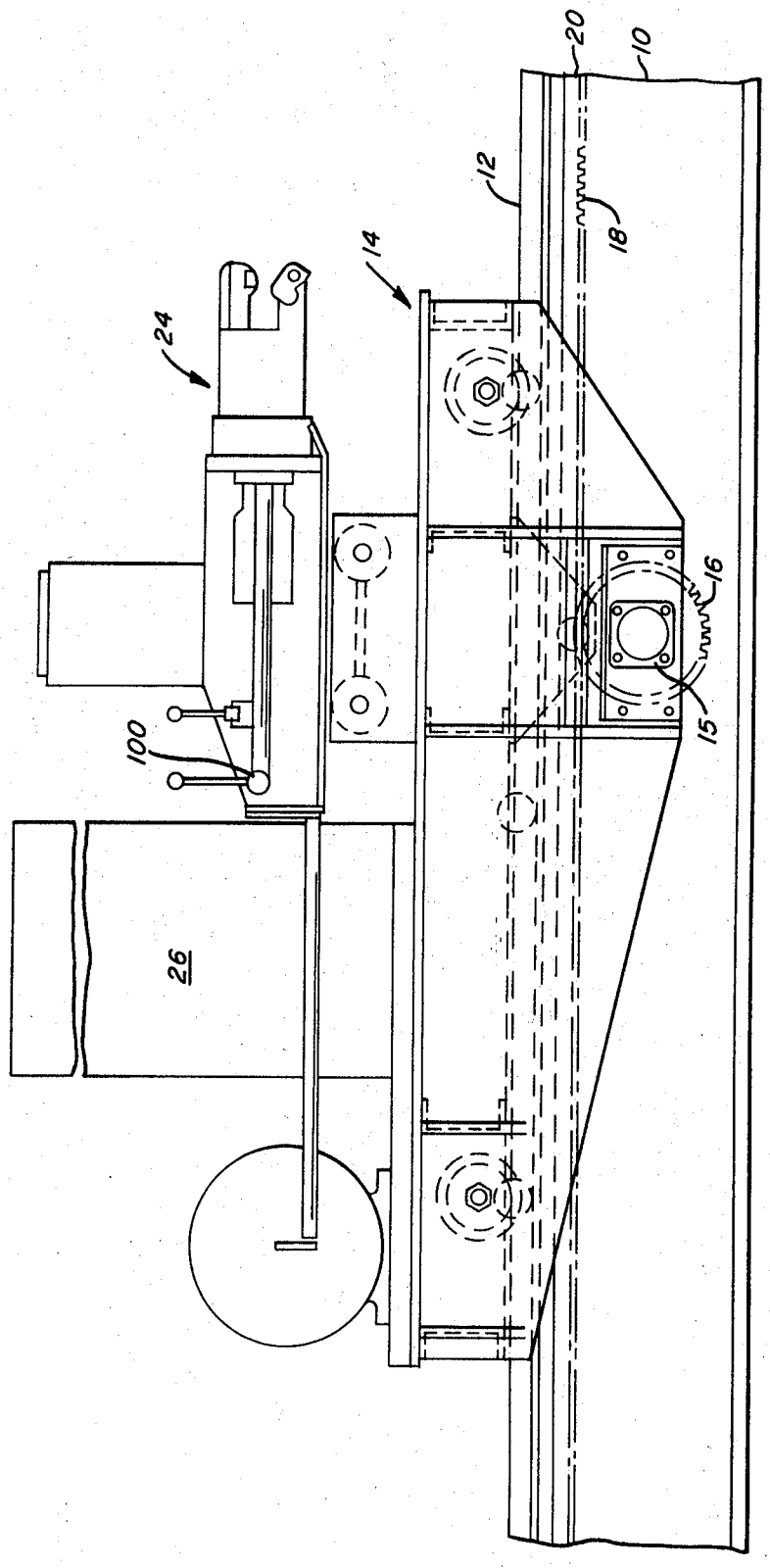


FIG. 2

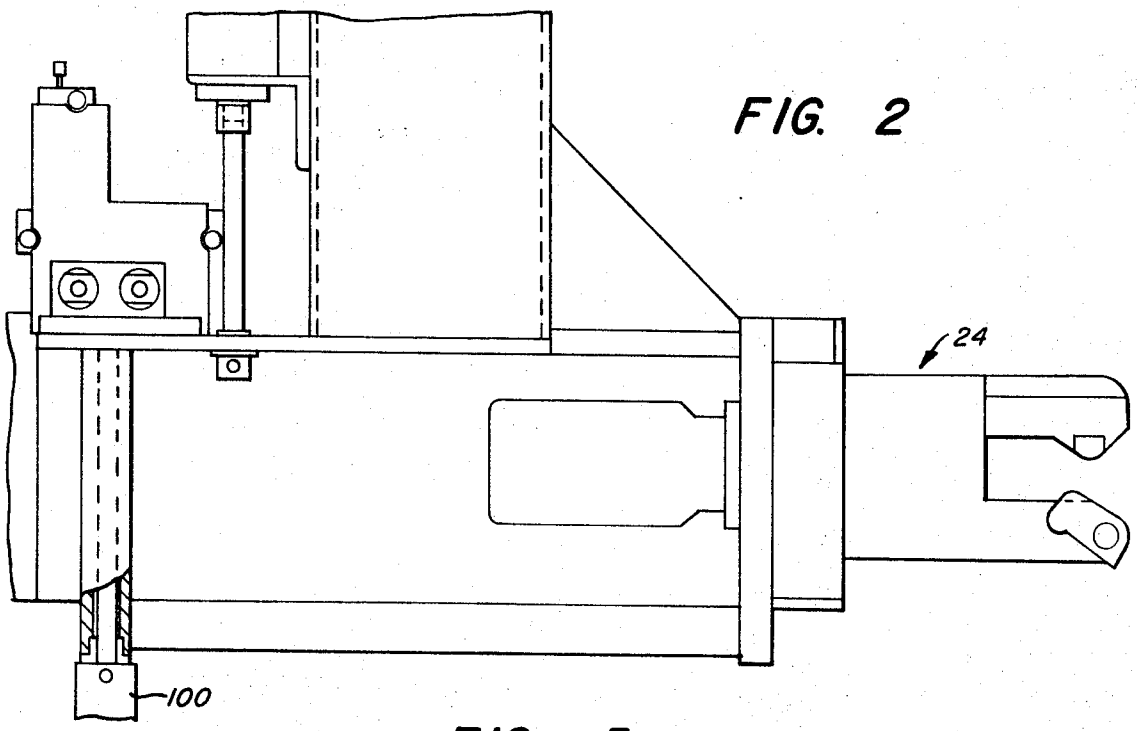


FIG. 5

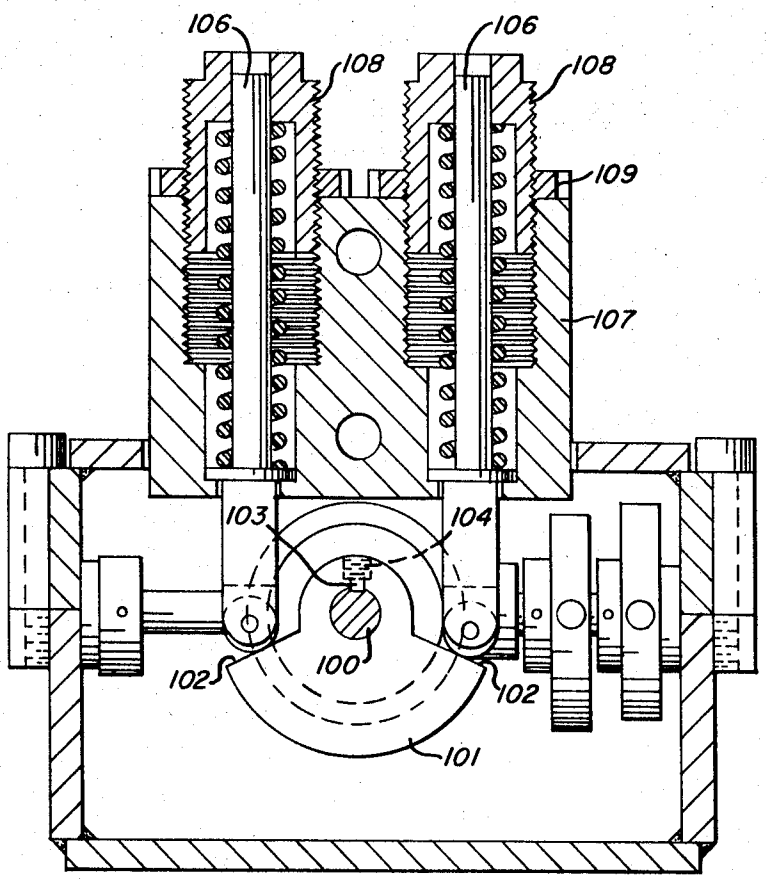


FIG. 3

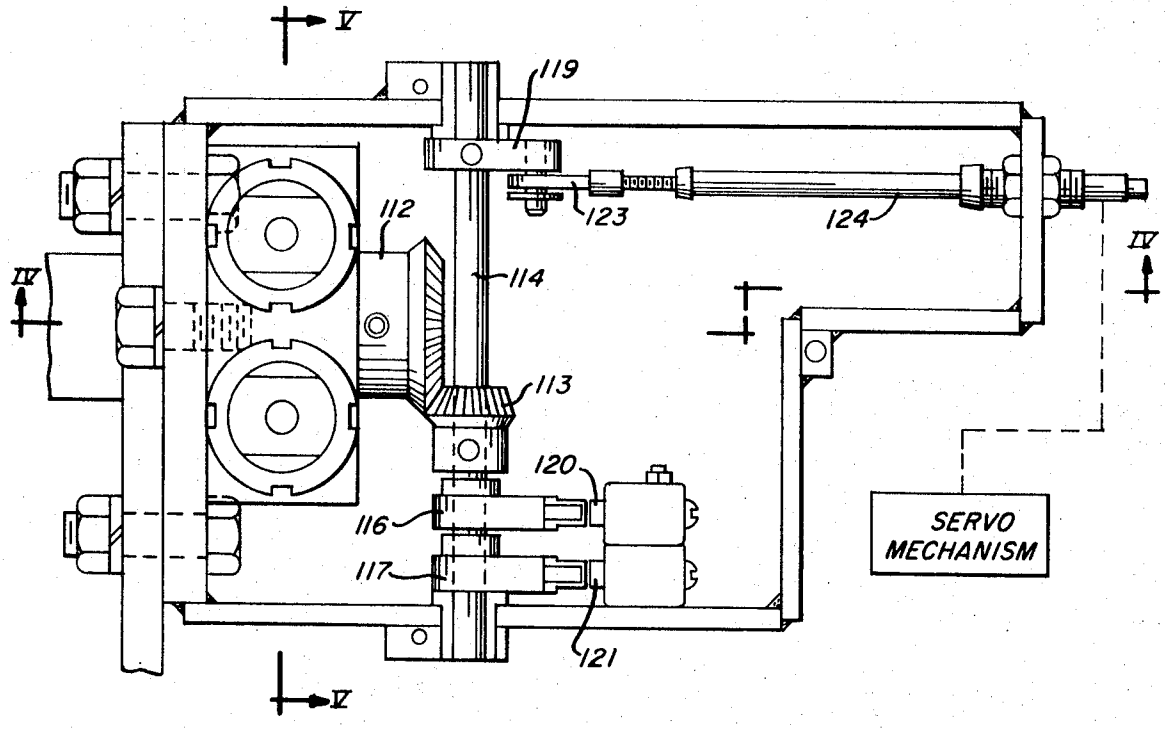
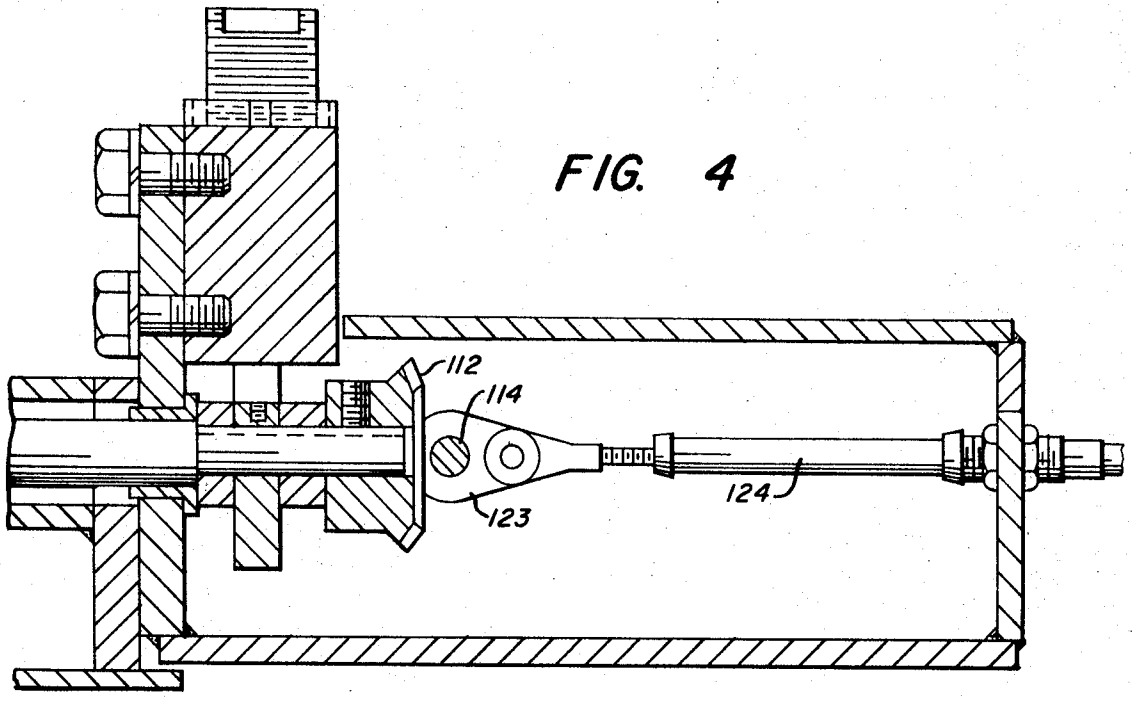

V
119
112
123
124
IV
III
114
113
120
116
117
121
SERVO MECHANISM
V

FIG. 4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114
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VARIABLE SPEED BI-DIRECTIONAL CONTROL MECHANISM

This invention relates to a mechanism for controlling movement of a carriage.

Although my invention is not thus limited, one application for which the mechanism is particularly useful is in a rail manipulator such as that shown in Bullard application Ser. No. 233175 filed of even date.

In the rail straightening operation subsequent to the hot rolling of rails, an operator physically propels a rail in both directions through a gag press. Mechanical devices to perform this function have long been desired. However, the devices developed heretofore have not provided the required responsiveness for the rail straightening operation. The Bullard manipulator is a rail-mounted carriage that is located at the exit end of a gag press. The carriage has a boom-mounted manipulator head extending to one side. The head includes a rail clamping and rotating mechanism for grasping the web of a rail and rotating it about its longitudinal axis. The apparatus of my invention provides the necessary control for propelling the rail through the gag press. Nevertheless my invention has general application for controlling the direction and speed of movement of any carriage which is movable in two directions.

It is the primary object of the subject invention to provide an apparatus that will give instant response to an operator, have fingertip control, will cause a carriage to move at variable speeds and in two directions with but a single control lever.

It is also an object to provide the invented mechanism with a dead-man control or instant shutdown control.

In the appended drawings:

FIG. 1 is an elevation view of a rail manipulator including the invented variable speed bi-directional control mechanism.

FIG. 2 is an enlarged top view of a portion of FIG. 1.

FIG. 3 is a plan view of the variable speed bi-directional control mechanism with the cover removed.

FIG. 4 is a sectional view of the control mechanism taken along line IV—IV of FIG. 3.

FIG. 5 is a sectional view of the control mechanism taken along line V—V of FIG. 3.

For purposes of illustration FIG. 1 shows a rail manipulator like that shown and claimed in the aforementioned Bullard application. The machine comprises a base 10, rails 12 mounted on the base, and a wheeled carriage 14 which rides on the rails. The carriage is propelled along the track by a reversible hydraulic motor 15 which drives a pinion 16 which engages a rack 18 mounted on the underside of rail base 20. The carriage 14 carries on it a manipulator head 24, a hydraulic tank or reservoir 26, and all of the necessary hydraulic equipment to provide power for the drive motor and the manipulator head 24. The manipulator is mounted at the exit end of a gag press (not shown) for movement along the line of movement of a rail through the gag press.

As shown in FIG. 5, a handle 100 has a dead-man control or centering cam 101 with symmetrical shoulders 102 fixed to the handle by a key 103 and a set screw 104. A pair of spring loaded plungers 106 extending through housing 107 bear against shoulders 102. Spring retainers 108, which are exteriorly threaded, are screwed into the threaded portions of housing 107 to the proper depth to create equal compressive force on the plungers. When the proper compression has been achieved on the springs, locking nuts 109 are tightened against the end of housings 107.

As shown in FIG. 3, a bevel gear 112 is fixed to the end of handle 100 and engages a bevel gear 113 which is fixed to a shaft 114. Shaft 114 also carries cams 116 and 117, and a lever 119 at the opposite end of the shaft from the cams. Cams 116 and 117 control microswitches 120 and 121, respectively. Each microswitch controls one direction of movement of the carriage. Lever 119, through a knuckle or clevice 123, is connected to a cable 124 which operates a servo valve 125, shown only diagrammatically on a hydraulic pump mounted on the outside of hydraulic tank 26. The servo valve, which is a device well known in the art, controls the speed at which carriage 15 moves along the track.

Movement of the carriage 14 along track 12 is controlled by my variable speed bi-directional control mechanism. In operation, when the operator moves the handle 100 toward the gag press, carriage 14 moves in that direction. The rotation of handle 100 rotates bevel gear 112 which causes rotation of bevel gear 113 and with it shaft 114. Cams 116 and 117, fixed to shaft 114, control microswitches 120 and 121 and thus the direction of the movement of the carriage. The cams are eccentrically arranged in such manner that only one cam can contact a microswitch at any one time. The amount of rotation of shaft 114 controls the opening of the servo valve 125 connected to cable 124. Thus the farther handle 100 is moved from the center position, i.e., the greater angle through which shaft 114 is rotated, up to a maximum of 90°, the higher the speed at which the carriage will move.

When the straightener releases handle 100, the springs in housing 107 cause the plungers 106 to return to their equilibrium position as shown in FIG. 5. This action causes the rotation of shaft 114 to a neutral position stopping the movement of the carriage.

It is readily apparent from the foregoing that I have invented an apparatus whereby manipulation of a single lever controls both the speed and direction of movement of a carriage.

I claim:

1. In a machine which includes a carriage, and variable speed reversible drive means operatively connected with said carriage for propelling it in either of two directions, the combination therewith of an improved control mechanism for said drive means, said mechanism comprising:

a rotatable shaft,

a centering cam rotatable by said shaft having two shoulders arranged symmetrically around the axis of the cam,

biasing means bearing against each of said shoulders to maintain said cam and shaft in a predetermined position when the control mechanism is inoperative,

means for rotating said shaft in both directions from said predetermined position,

means operable by movement of said shaft in one direction to cause movement of said carriage in one direction,

means operable by movement of said shaft in the opposite direction to cause movement of said carriage in the opposite direction, and

means operable by movement of said shaft in each direction to vary the speed of movement of said carriage.

2. Apparatus according to claim 1 wherein said biasing means is a spring-mounted plunger.

3. Apparatus according to claim 1 wherein said means for rotating said shaft is a handle engaging said shaft.

4. Apparatus according to claim 1 wherein each of said means to cause movement of said carriage comprises a cam fixed to a second shaft rotatable by said

first-named shaft, and a microswitch operable by engagement of said microswitch by said cam.

5. Apparatus according to claim 1 wherein said means to vary the speed of movement of said carriage comrises a second shaft rotatable by said first named shaft, an arm fixed to said shaft, a clevice pivotally connected to said arm, a connecting member fastened to said clevice, a source of power, and a servo valve on said source fastened to said connecting member.

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