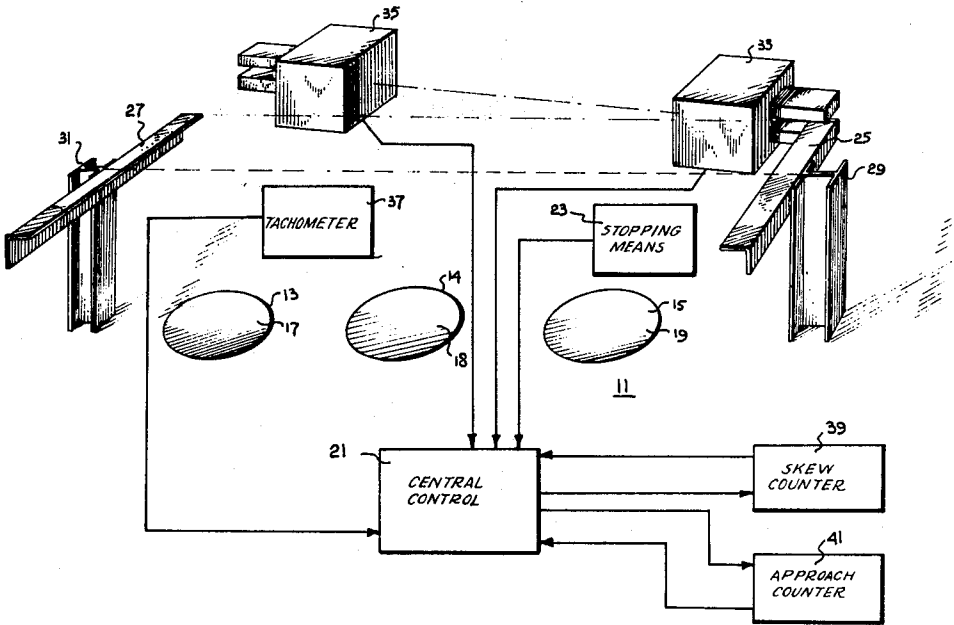


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[54] **COKE OVEN CHARGING CAR LOCATING CONTROL**
4 Claims, 2 Drawing Figs.
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214/16.4; 318/52
[51] Int. Cl..... B60I 3/00
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246/187, 167; 318/52

ABSTRACT: Apparatus for compensating the misalignment of a car for charging coal into a coke oven, wherein a central control roughly positions the car in response to pulses from a digital tachometer located on the car. Fine positioning of the car is performed by utilizing the stored pulses of a skew counter and an approach counter under control of signals produced by limit switches carried by the car and actuated by positioning elements on the oven.



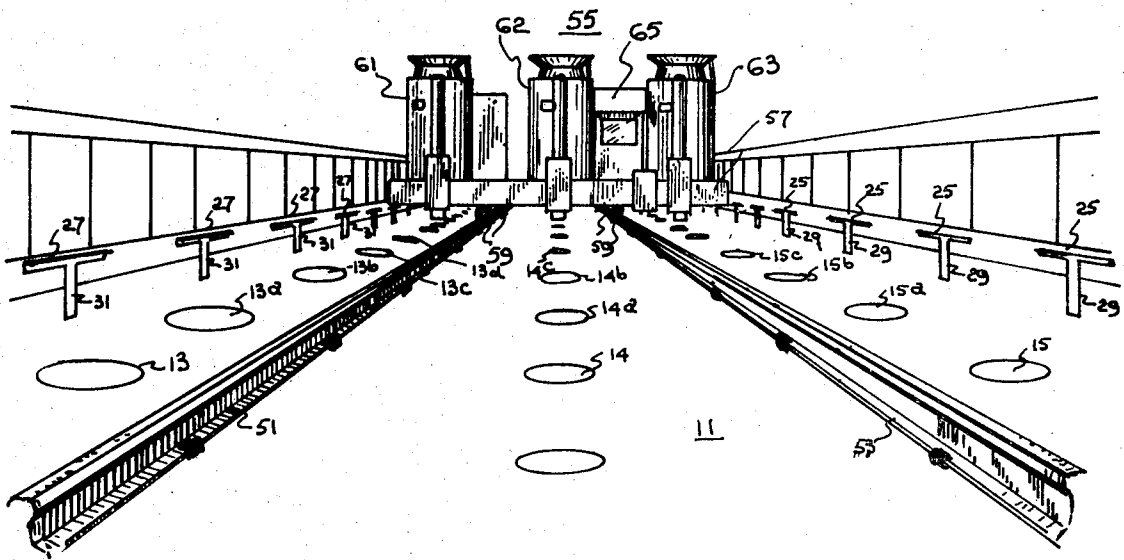


Fig. 1

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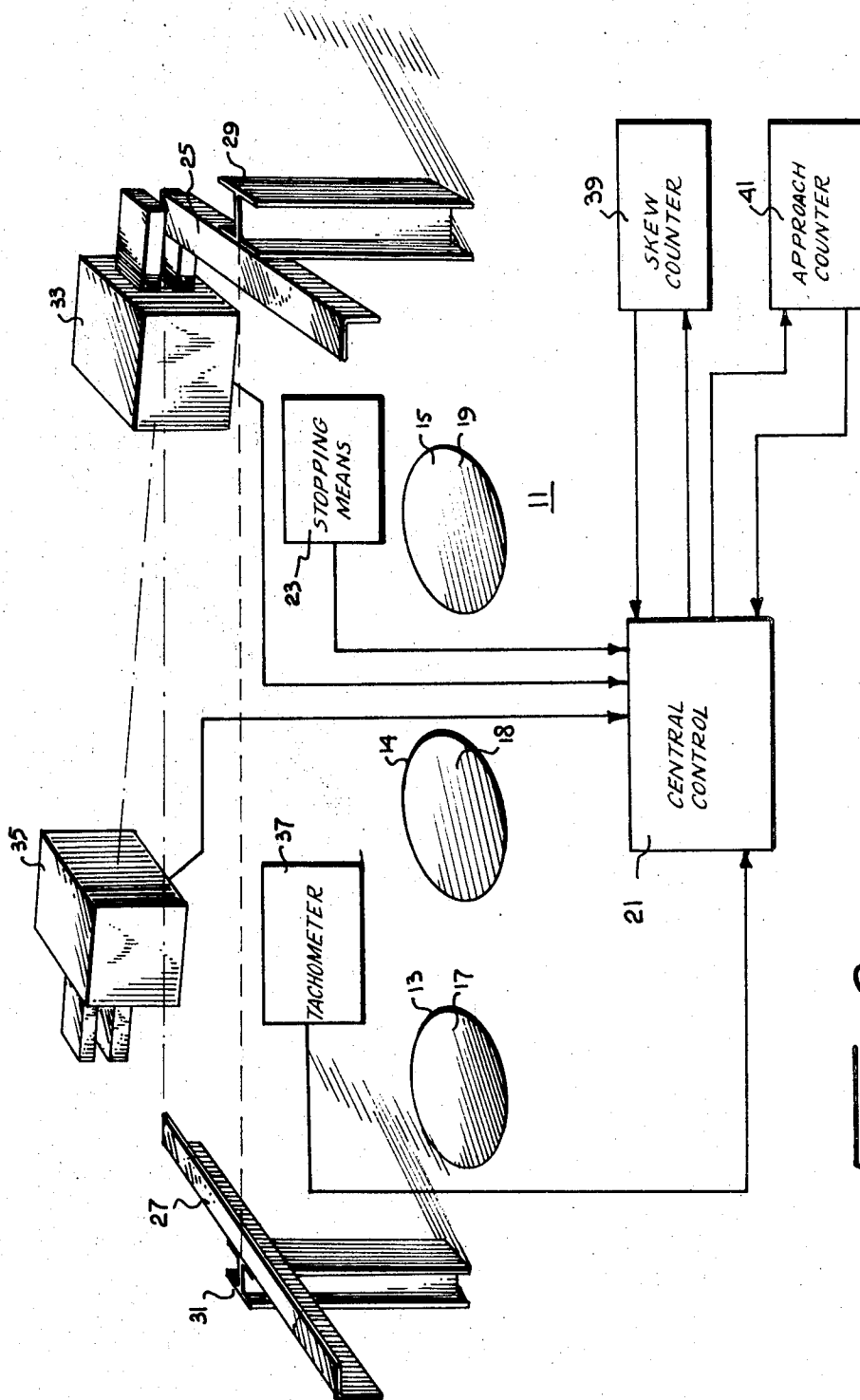


Fig. 2

COKE OVEN CHARGING CAR LOCATING CONTROL

BACKGROUND OF THE INVENTION

In a coke oven battery, charging of coal into the oven is performed by a charging or larry car, which moves on rails provided therefor on the oven top. Depending on the design of the oven, the car generally comprises a frame supported by the wheels having three or more coal hoppers. A cab provides protection for the operator who is assigned to load the hoppers at preassigned coal bunkers and deliver the load to a predetermined oven of the coke oven battery. Each of the hoppers is provided with a movable sleeve which, during the charging of the oven, is extended into the bin openings provided in the top of the coke oven. Clearance between the sleeve and the bin opening is generally not more than 1½ inches so that even a small amount of misalignment between the sleeve and the bin opening will prevent insertion of the sleeve. Upon approaching the preassigned oven, the operator has to make several approaches before proper alignment of the car with the bin opening openings is accomplished since in the slowing down of the car by applying partial braking a skew or oblique condition of the car, having a width of over 30 feet, may arise.

SUMMARY OF THE INVENTION

To meet the requirements of accurately stopping the charging car at the predetermined oven, the present invention teaches an apparatus which will compensate for the effect of the obliqueness by using a pair of actuators positioned on the top of the oven, on either side of the path of travel of the car, in a fixed relationship with the bin openings. A pair of sensors for coaction with the actuators are mounted on opposite sides of the car to provide a pair of triggering signals, the displacement interval of which is proportional to the obliqueness of the car. A pulse generator provides pulses in proportion to distance moved by the car, which are accumulated by an oblique counter during the interval between the triggering signals produced by the sensors. An approach counter is preset with a count which is proportional to the distance from the actuating elements to the final stopping point; i.e., alignment with the bin openings. The contents of the oblique counter is divided in half and the quotient is then subtracted from the contents of the approach counter. The pulse generator-producing pulses in response to movement of the car, causes counts to be removed from the approach counter from the time the trigger signal of the second sensor has occurred. When the count in the approach counter has been reduced to ZERO the car is stopped. The position of the charge car is such at this time that the oblique orientation of the car is symmetrically displaced with reference to the centerline of the bin openings in the top of the oven.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a charging car positioned on tracks located on top of a coke oven battery, having bin openings provided therein for the purpose of charging the ovens with coke.

FIG. 2 is a perspective view presenting an oblique relationship of the vane limit switches to the vanes and bin openings in the oven top, and including a block diagram showing interrelations of electrical and mechanical components.

DETAILED DESCRIPTION

Referring to FIG. 1 wherein a coke oven battery top 11 is provided with a pair of rails 51 and 53 on which a charging car 55 moves for delivering coal to the individual ovens (not shown) which make up the entire coke oven battery. The charging or larry car 55, movably supported by wheels 59, has a frame 57 which carries three coal hoppers 61—63, and an operator's cab 65. Depending on the coke oven design, the number of hoppers on the charging car and corresponding bin openings may be increased to four or five.

The bottoms of the coal hoppers are provided with valved openings wherein a retractable sleeve (not shown) is located which during charging of the ovens is extended into bin openings 13—15 provided in oven top 11 for the transfer of coal from the car to the ovens. FIG. 1 shows a series of sets of bin openings wherein each set is part of an individual oven; for example, bin openings 13—15 nearest to the reader are used for charging a first oven, 13a—15a are used for charging the oven adjacent thereto, 13b—15b apply to the third oven, and other bin openings including 13b—15c are used for charging coal into successive ovens of the coke battery.

A pair of vane limit switches (not shown) are attached to either side of the car for coaction with pairs of vanes 25 and 27 positioned by supports 29 and 31, respectively, which are in a fixed relationship with the bin openings 13—15 of each of the ovens.

In charging the oven the charging car must be accurately positioned allowing the retractable sleeves provided in the bottom of the hoppers to protrude into the bin openings 13—15 and effect the transfer of the coal. Since the bin openings are generally 2 inches larger than the sleeves to be inserted therein, the alignment of the car must be made within that tolerance. Due to the great width of the car, sometimes more than 40 feet, and the possibility of uneven braking during slowdown, a skew or oblique condition of the car may develop, causing the alignment requirements to be increased. Since the operator's cab is located on one side of the car, the method of alignment detection is generally made from that side, so that positioning accuracy requirement must be plus-minus one-fourth inch to allow for a possible car obliqueness of plus-minus 1½ inch. Alignment of the car from the center reduces the oblique tolerance between the car and the opening to plus-minus three-fourths inch which concludes that the accuracy requirement of stopping the car is reduced to plus-minus 1 inch.

Referring now to FIG. 2 wherein coke oven top 11 is shown to contain three bin openings 13—15 through which the coal is charged into the oven (not shown). These bin openings 13—15 are provided with bin lids 17—19, respectively, which through means (not shown) on the car (not shown) are removed for the purpose of transferring coal to the oven.

Two vanes 25 and 27 positioned with each oven on supports 29 and 31 in a fixed relationship with the centerline of the bin openings 13—15, are provided for coaction with two vane limit switches 33 and 35 which are positioned on the sides of the charging car (not shown). The FIG. shows an oblique condition developed during slowdown of the car causing limit switch 33 to lead and initially respond to the presence of vane 25. Lagging vane limit switch 35 will, upon further advance of the car, respond to the presence of vane 27. Were the oblique condition reversed, vane limit switch 35 would be the leading switch and would coact with vane 27 first, resulting in vane limit switch 33 lagging and coacting with vane 25 subsequently. The reaction of vane limit switch 33 to the presence of vane 25 causes an electrical signal to be produced which is applied to central control 21, resulting in the accumulation of pulses by skew counter 39.

The pulses are produced by tachometer 37 which is assembled to one of the wheel shafts (not shown) of the car, so that the number of pulses is proportional to the distance traveled by the car. As the car continues travel, vane limit switch 35 engages with vane 27 and produces an electrical signal which is applied to the central control 21, and inhibits the skew counter 39. This counter now contains an accumulated count proportional to the amount of skew of the car with respect to the centerline of the bin openings.

An approach counter 41 is preset with a count. In response to the signal from vane limit switch 33, central control presets an approach counter 41 with a number which is proportional to the distance which the car must travel to the centerline of the bin openings. From this preset number, half the contents of the skew counter is subtracted, resulting in a number which is equal to the distance to be traveled by the car. When vane

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limit switch 35 produces its signal, central control 21 is caused to apply pulses from tachometer 37 to approach counter 41, which then "down counts"; i.e., counts are removed from the contents of the counter with each pulse applied thereto as the car advances toward the centerline of the bin openings. When the contents of approach counter 41 is reduced to ZERO, the car is stopped by appropriate means illustrated broadly by block 23. At this point, vane limit switch 35 has advanced to a point which is ahead of the bin opening centerline by an amount equal to half the skew dimension, and vane limit switch 33 is positioned at a point an equidistant beyond the bin opening centerline, hence the skew of the car is symmetrically apportioned about the centerline of the bin openings whereby the effect of the misalignment of the sleeves with respect to the bin openings is reduced to a minimum.

While the invention has been explained and described with the aid of particular embodiments thereof, it will be understood that the invention is not limited thereby and that many modifications retaining and utilizing the spirit thereof without departing essentially therefrom will occur to those skilled in the art in applying the invention to specific operating environments and conditions. It is therefore contemplated by the appended claims to cover all such modifications as fall within the scope and spirit of the invention.

I claim:

1. An apparatus for accurately stopping at a station a vehicle oriented obliquely with respect to its path of travel so that the effect of the obliqueness is compensated for, comprising:

- a. first and second actual actuating elements located on opposite sides of the path of travel of the vehicle;
- b. first and second sensors for cooperation with said actuating elements positioned on opposite sides of the vehicle, said sensors producing triggering signals, simultaneously only when the obliqueness of the vehicle is zero;

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- c. means for generating pulses in proportion to distance traveled by the vehicle;
- d. an oblique counter connected to said first and second sensors and said pulse generating means for accumulating a count during the time interval between the triggering signals from said first and second sensors, said count being proportional to the obliqueness of the vehicle;
- e. a preset approach counter initially containing a count proportional to the distance between said actuating elements and the station measured along the path of travel;
- f. means for modifying said preset count by a predetermined fraction of the contents of said skew counter;
- g. means for applying the output of said pulse generating means to said approach counter following the trigger signal of said second sensor to reduce the count in said approach counter; and
- h. means responsive to a predetermined count in said approach counter to stop the vehicle.

2. The invention claimed in claim 1 wherein said first and second sensors are vane limit switches and said actuating elements are vanes.

3. The invention claimed in claim 1 wherein said modification of said preset count in the approach counter is performed by subtracting half of the contents of the oblique counter therefrom.

4. The invention claimed in claim 1 wherein said modification of the preset count in the approach counter is performed by adding half of the contents of the oblique counter, and means for applying the output of said pulse generating means to a said approach counter following the trigger signal of said first sensor to reduce the count of said approach counter.

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