

[54] **METHOD AND MEANS FOR CONTROLLING THE DISTANCE BETWEEN TWO MOVING CONVEYANCES**

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[57] **ABSTRACT**

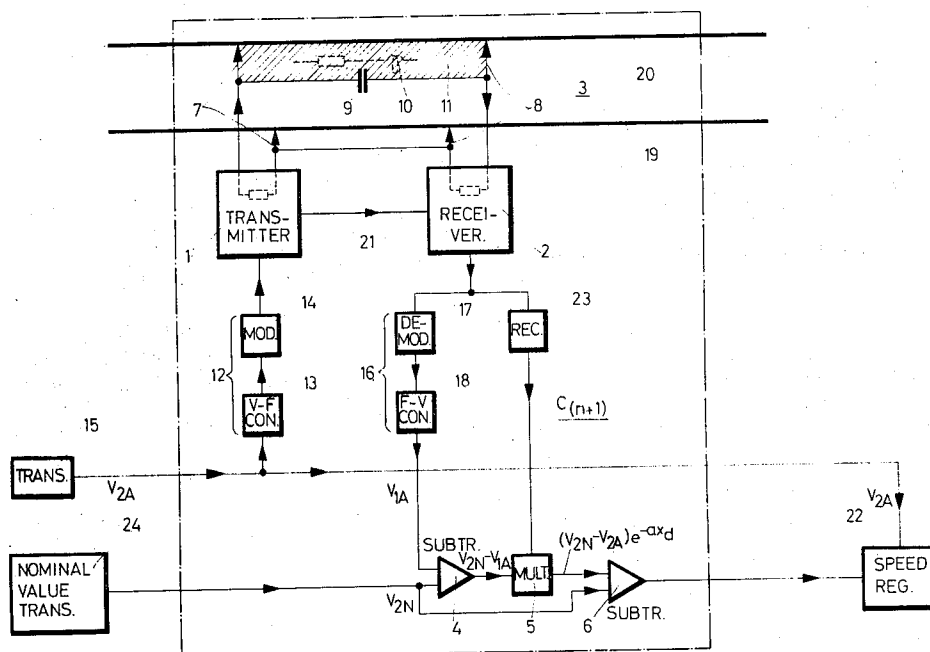
Each of a column of conveyances transmits a high frequency signal, modulated with a frequency corresponding to its actual speed, along a line, such as a power line, connecting the conveyances. A control circuit in the following conveyance receives and demodulates the signal and subtracts it from a signal corresponding to a desired or nominal speed. The control circuit also multiplies the result with a measure of departure from a predetermined distance between conveyances, namely with the attenuated amplitude of the received signal. The control circuit then regulates the speed of the following conveyance therewith. This allows large numbers of vehicles following each other to proceed at high speeds while remaining closely spaced.

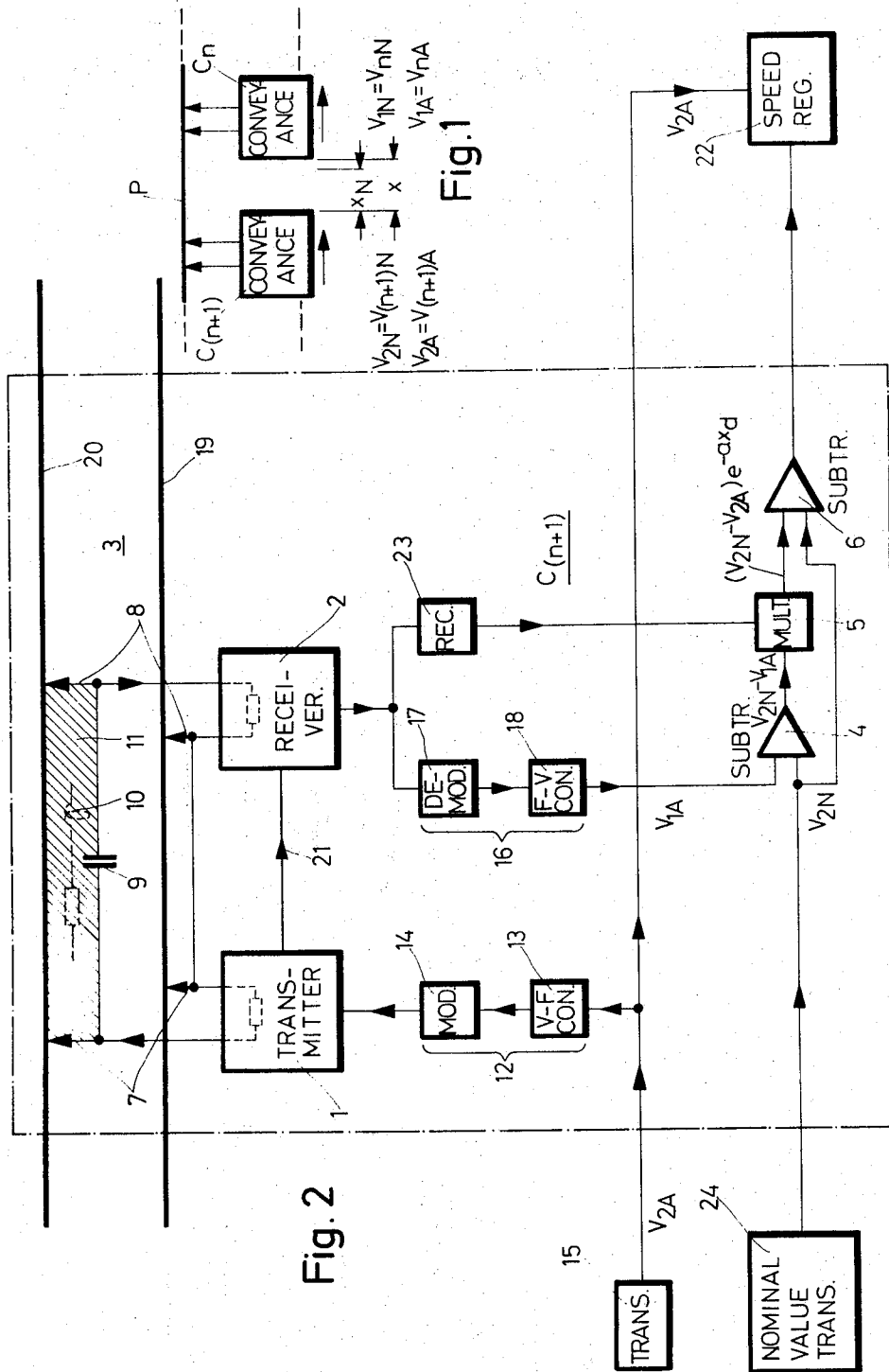
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38 Claims, 2 Drawing Figures





METHOD AND MEANS FOR CONTROLLING THE DISTANCE BETWEEN TWO MOVING CONVEYANCES

BACKGROUND OF THE INVENTION

This invention relates to transport systems using spaced conveyances that follow one another, and particularly to methods and means for maintaining desired distances between conveyances following each other as part of a transport system. The invention also concerns circuit arrangements which form these means.

Such methods and means are important wherever it is advantageous for conveyances to follow each other as closely as possible without colliding. The conveyances may constitute cabins, cars, containers, vehicles, etc. for conveying either people, cargo, messages, or combinations of these.

Presently, one method of spacing such conveyances involves dividing the entire track of a conveyer system into block sections and allowing a conveyance to enter a block section only when this block section is free, that is, when there is no other conveyance within this block section. This method is disadvantageous in that the length of the individual block sections determines the minimum distance between two cabins, regardless of the speed of the cabins. High conveyer efficiencies and outputs cannot be achieved in this manner.

It is also feasible to measure the distance between two conveyances or cabins with the reflection of electromagnetic waves and then to use the actual value of the distance thus determined for regulating the distance between the conveyances. Such a method would fail, however, when the cabins or conveyances do not follow a continuously straight path, because, under certain circumstances, reflections would no longer be measurable.

An object of the invention is to improve presently available systems of this kind.

Another object of this invention is to eliminate the disadvantages mentioned above.

Still another object of the invention is to provide a method and means, such as a circuit arrangement, which permits a transport system or conveyer system to achieve a high output, that is, to operate at high speeds with small inter-conveyance distances, while nevertheless, operating independent of the geometry of the track of the conveyer system.

SUMMARY OF THE INVENTION

According to a feature of the invention these objects are attained, by determining the distance x between a conveyance or cabin and a following conveyance or cabin with suitable wiring, by deriving a control quantity v_{2C} from the actual or nominal value v_{1N} of the speed of the leading cabin and the determined distance x , and by superimposing the control quantity v_{2C} on the nominal value v_{2N} of the speed of the following or second conveyance or cabin.

The invention proceeds from a number of premises. The first premise is that the second or following cabin can travel at the nominal value v_{2N} of the speed when the nominal value v_{1N} of the speed of the leading or first cabin is equal to the nominal value v_{2N} of the speed of the second cabin. The second premise is that there should be no difference between the actual value v_{1A} and the nominal value v_{1N} of the speed of the first cabin and thus between the actual value v_{1A} of the speed of

the first cabin and the desired or nominal value v_{2N} of the speed of the second cabin. The third premise is that the distance x between the two conveyances or cabins is equal to a nominal value x_N , and a distance x_D between the two cabins which exceeds the nominal value x_N does not exist.

According to the invention if one of the above indicated three criteria is not attained, a control quantity V_{2C} , which is not equal to zero, is superimposed on the theoretical nominal value v_{2N} of the speed of the second cabin so that a true nominal value v_{2NT} represents the resulting speed. This latter value differs from the theoretical nominal value v_{2N} .

According to another feature of the invention, the control value v_{2C} includes a term $\sqrt{2(x_{\max} - x_D)b}$, where x_D denotes the distance between the two cabins or carriers which exceeds the nominal value x_N , and where b is a constant retardation or delay selected so that, starting from a maximum distance $x_{\max}$ between the two cabins and the nominal value v_{2N} of the speed of the cabin, this second cabin stops at the nominal value x_N of the distance from the stationary first cabin or carrier. The control quantity v_{2C} thus represents a parabolic function of the distance x_D exceeding the nominal value x_N .

This brings up another feature of the invention which is of particular importance. By eliminating the delay b , the control quantity v_{2C} is determined according to the equation $v_{2C} = e^{-ax_D}(v_{2N} - v_{1A})$. Here e is the base of natural logarithms, x_D the distance between two conveyances exceeding the nominal value x_N , a is a constant, v_{2N} is the nominal value of the speed of the second conveyance, and v_{1A} is the actual value of the speed of the first conveyance. The parabola $\sqrt{2(x_{\max} - x_D)b}$ is thus approximated by the exponential function e^{-ax_D} which introduces a substantial simplification.

The simplification is particularly effective when the factor e^{-ax} is determined by the propagation of a high frequency voltage transmitted by the first conveyance along a homogeneous high frequency line and received by the second conveyance also connected to the line. The utilization of the law of propagation of high frequency voltages on a homogeneous high frequency line thus yields a quantity following an exponential function. The constant a is the attenuation constant which results from the line constant of the high frequency line and approximates $R'/2 \cdot C'/L'$. Here R' denotes the specific resistance of the line, C' the specific capacitance in L' the specific inductance.

According to another feature of the invention, the system is used with the plurality of conveyances connected to the high frequency line. Electrical means are included to assure that the propagation of the high frequency voltage occurs only backwards, from each conveyance to the following conveyance, but not backwards to the next successive conveyance, and not forward to the preceding conveyance.

According to another feature of the invention, the actual value v_{1A} of the speed of each preceding conveyance is transmitted to the immediately following conveyance by frequency modulating the high frequency voltage with a modulation frequency corresponding to the actual value v_{1A} of the speed of the first conveyance.

The invention, as mentioned above, may be embodied as an apparatus or electrical circuit system. According to a feature of the invention, the system in each

conveyance includes transmitter means for transmitting a carrier signal modulated by a signal corresponding to the actual speed of the conveyance toward the subsequent conveyance along a high frequency line extending from one conveyance to the next, receiver means for receiving the correspondingly transmitted signal along the line of the previous conveyance for receiving and demodulating the high frequency signal from the previous conveyance and converting it to a demodulation dependent voltage, subtraction means responsive to the receiver means for subtracting the thus formed voltage from a nominal voltage representing the nominal or desired value of the speed of the conveyance so as to produce the value $v_{2N} - v_{1A}$, multiplier means connected to the receiver means for extracting from the receiver means a value e^{-ax} and multiplying it with the output of the subtraction means so as to produce a result $v_{2C} = e^{-axd}(v_{2N} - v_{1A})$, and circuit means for superposing the value v_{2C} on the nominal value v_{2N} for regulating the speed of the conveyance.

According to another feature of the invention, in the network arrangement or system utilizing a plurality of conveyances connected to the high frequency line, capacitor means connects the output of said transmitter means with the input of the receiver means at the high frequency line for forming a parallel resonant blocking circuit with the distributed inductance of the high frequency line at and about the carrier frequency. Thus, the propagation of high frequency signals takes place only from the transmitter of the conveyance to the receiver of the following conveyance but not to the receiver of the preceding conveyance. This assures a high impedance formed by the capacitor with the distributed inductance of part of the high frequency line. Thus, propagation of high frequency voltage takes place only from the transmitter means of the n -th conveyance to the receiver of the $(n+1)$ -th conveyance.

According to another feature of the invention, the transmitter means in each conveyance is connected to the line closer to the trailing end of the conveyance than is the receiver means.

In this system the actual value v_{1A} of the speed of the first conveyance is reported to the second conveyance by frequency modulating the high frequency carrier with a modulation frequency corresponding to the actual value v_{1A} of the speed of the first conveyance. According to another feature of the invention the transmitter means includes a transmitter and a cascade connection of a voltage-frequency converter and a modulation connected to the input of the transmitter. Voltage forming means form a voltage proportional to the value v_{2A} of the speed of the second conveyance and feed this to the voltage-frequency converter. A demodulator cascaded with a frequency-voltage converter connected to a receiver form the receiver means. The actual value v_{nA} of the n -th conveyance is transmitted in the form of the frequency modulation to the $(n+1)$ -th conveyance, while the n -th conveyance receives the actual value $v_{(n-1)A}$ as a frequency-modulation of the high frequency carrier.

According to another feature of the invention, the high frequency line is composed of a neutral conductor of the power supply line and a high frequency bus or bar. Thus, in addition to the existing power supply line, only a high frequency bus or bar has to be provided.

According to another feature of the invention, the high frequency bus or bar is composed of a material

having a pre-determined specific ohmic resistance R' to achieve a predetermined attenuation constant a and utilizing the so-called skin effect.

Such a material contrasts with the low impedance material of the neutral conductor of the power supply line which usually consists of copper. According to another feature of the invention, the high frequency bus or bar is composed of iron having a conductance x of about 10 and a permeability μ of about 1500, while operating with a transmitter carrier frequency of about 500 MHz.

According to yet another feature of the invention, a part of the signal from the transmitter means is negatively fed back to the receiver means in the conveyance. The degree of negative feedback is adjusted so that the exponential function e^{-axd} corresponds to the parabola $\sqrt{2}(x_{\max} - x)d/b$. Moreover, the negative feedback is adjusted so as to compensate for any finite impedance exhibited by the parallel resonant circuit formed by the capacitor means and the distributed inductance of the line. According to yet another feature of the invention, the above described error or failure of the parallel resonant circuit to exhibit an infinite impedance, and the negative feedback, are used to check the transmitter and the receiver.

The advantages achieved by the invention can be summarized as follows. The method defined above, and the apparatus or network arrangement or system defined above, permit a transportation system to achieve an extremely high conveyer output. That is, it results in a small distance between individual conveyances travelling at high speeds without the risk of one conveyance colliding with another. Beyond that, the fact that the conveyances are wire or line bound ensures that the geometry of the track of the transport system does not influence the efficiency of the method and apparatus embodying the invention. These advantages are achieved at relatively low cost, with respect to equipment such as the track of the transport system and the individual conveyances.

These and other features of the invention are pointed out in the claims. Other objects and advantages of the invention will become obvious from the following detailed description when read in light of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a block diagram illustrating, in simplified form, a transport system embodying features of the invention; and

FIG. 2 is a block diagram illustrating a network forming a part of one of the conveyances in FIG. 1 and embodying features of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In FIG. 1, the n -th and $(n+1)$ th conveyances C_n and C_{n+1} are powered by a power line P to travel to the right along with preceding and following conveyances not shown. An actual distance x_A separates the two conveyances shown. For the particular travelling speed the desired or nominal distance between conveyances is x_N . The leading conveyance C_n travels at an actual speed v_{nA} and is followed by the conveyance C_{n+1} travelling at the actual speed $v_{(n+1)A}$. The desired or nominal speeds of these conveyances is v_{nN} and $v_{(n+1)N}$.

For analysis a pair of conveyances such as that shown may be considered alone. In that case the subscripts n and $n+1$ may be replaced with 1 and 2. Thus, their nominal speeds are v_{1N} and v_{2N} while their actual speeds are v_{1A} and v_{2A} .

FIG. 2 illustrates, in block diagram form, the electrical control network of any conveyance in the system of FIG. 1.

In FIG. 2 an actual value transmitter 15 senses the actual speed of the conveyance illustrated and applies a voltage corresponding to that speed to a modulator system 12 composed of a voltage-frequency converter 13 and a modulator 14. The modulator system 12 modulates a high frequency transmitter 1 at a frequency value corresponding to the actual speed of the conveyance illustrated in FIG. 2 and carrying the transmitter 1.

The transmitter 1 produces a modulated carrier signal and applies it to a line 3 so that the signal travels along the line to the following conveyance at the left.

It should be understood that each of the conveyances have identical electrical networks connected to the line 3 so that each transmits a frequency modulated signal along the line 3.

A high frequency receiver senses signals propagated by the transmitter of the preceding conveyance, on the right. These signals also correspond, in attenuated form, to the actual value of the speed of the preceding conveyance. A capacitor 9 connecting the output of the high frequency transmitter 1 to the input of the high frequency receiver 2 forms a parallel resonant circuit with the distributed inductance of the line 3. The capacitor 9 tunes the parallel resonant circuit to a frequency corresponding to and about the carrier frequency of the transmitter 1 in each of the conveyances. Therefore, the parallel resonant circuit formed by the capacitor and distributed inductance produces a high impedance to carrier frequency signals. Thus, the energy of the transmitter 1 is propagated principally to the left to the following conveyance, while the receiver 2 receives energy mainly from the transmitter 1 in the conveyance immediately preceding the conveyance illustrated. The parallel resonant circuit formed by the capacitor 4 and the distributed inductance further prevents continued propagation of the signal passing from the preceding conveyance to the left. Thus, each conveyance receives signals only from the preceding conveyance.

In each conveyance a demodulator system 16 composed of a demodulator 17 and a frequency-voltage converter 18 produces a voltage corresponding to the value v_{1A} of the speed at which the preceding conveyance actually travels. This is so because the signal transmitted by the transmitter 1 of the preceding conveyance was modulated at a frequency corresponding to the value v_{1A} of the speed of the preceding conveyance. Similarly, the following or subsequent conveyance will demodulate the signal emerging from the transmitter 1 and corresponding to the value v_{2A} of the actual speed of the conveyance shown.

A subtractor 4 receives the voltage corresponding to the value v_{1A} and subtracts it from a value v_{2N} received from a nominal value transmitter 24 and corresponding to the desired or nominal value of the speed of the conveyance illustrated in FIG. 2. A multiplier 5 multiplies the subtracted value $v_{2N} - v_{1A}$ with a value e^{-ax} formed by a rectifier 23 from the output of the receiver

2. This produces an output signal corresponding in value $v_{2C} = e^{-ax}d(v_{2N} - v_{1A})$

A subtractor circuit 6 responding to the output of the multiplier 5 and the nominal value transmitter 24 produces an output $v_{2N} - (v_{2N} - v_{1A})e^{-ax}d$. This is applied directly to a speed regulator 22 that also receives a signal from the actual value transmitter corresponding to the value v_{2A} . The speed regulator controls the operation and speed of the conveyance illustrated in FIG. 2.

Thus, it can be seen that an embodiment of the invention involves a number of conveyances, along a track, with a high frequency transmitter 1 and a high frequency receiver 2 in each conveyance, a high frequency line extending along the track of the conveyer system, a subtractor 4, a multiplier 5, and a second subtractor 6.

In each conveyance the circuit therein superimposes a control quantity v_{2C} on the nominal value v_{2N} of the speed of one of several conveyances. Two conveyances, one following the other, are considered in so far as the subscripts are concerned. The entire network is mounted on the plurality of conveyances, with the exception of the line 3. The control quantity v_{2C} is derived from the actual value v_{1A} of the speed of the first or leading conveyance of a pair, and the distance x between the first and second conveyances being considered. Specifically the control quantity v_{2C} is determined according to the equation $v_{2C} = e^{-ax}d(v_{2N} - v_{1A})$ where

e = base of natural logarithms

x_d = distance between two conveyances exceeding the nominal value x_N

a = a constant

v_{2N} = the nominal value of the speed of the second conveyance

v_{1A} = the actual value of the speed of the first conveyance.

The factor e^{-ax} is obtained by utilizing the law of propagation of high frequency voltages on a homogeneous high frequency line such as the line 3. The constant a is the attenuation constant of the high frequency line 3. This is obtained from the line constant of the high frequency line 3 and is equal approximately to $R'/2 \sqrt{C'/L'}$, where R' denotes the specific ohmic resistance, C' denotes the specific capacitance, and L' denotes the specific inductance.

Since the circuit arrangement disclosed in FIG. 2 is used in a plurality of cabins connected to the high frequency line 3 the capacitor 9 is arranged between the connection 7 of the transmitter 1 with the high frequency line 3 and the connection 8 of the receiver 2 with the high frequency line 3. This capacitor 9 forms a blocking circuit, namely a parallel resonant circuit with the corresponding inductance 10 of the high frequency line 3. This permits propagation of the high frequency voltage only from the transmitter 1 of the n -th conveyance to the receiver 2 of the $(n+1)$ -th conveyance.

In the circuit arrangement of FIG. 2 the actual value v_{1A} of the speed of the first conveyance is reported to the second conveyance by frequency modulation of the high frequency voltage corresponding to the actual value v_{1A} of the first conveyance. To this end the transmitter 1 is provided with an input that receives the output of a modulator system 12 composed of a voltage-frequency converter 13 and of a modulator 14. The voltage proportional to the actual value v_{2A} of the speed of the second cabin is fed from the actual value trans-

mitter 15 to the voltage-frequency converter 13 (or more precisely the voltage -to-frequency converter 13). The demodulator system 16 is connected to the output of the receiver 2. The system 16 is composed of the demodulator 17 and the frequency-voltage converter 18 (or more precisely the frequency-to-voltage converter 18) in cascade connection.

The high frequency line consists of the neutral conductor 19 of the power supply line P and of a high frequency bar or bus 20 which is made of iron with a conductance K of about 10 and a permeability μ of about 1500.

A part of the modulated output voltage produced by the transmitter is connected in negative feedback relation to the receiver 2 within the same conveyance. This is indicated by the arrow 21.

The apparatus embodying features of the invention operates as follows. The actual value transmitter generates a voltage corresponding to the actual value v_{2A} of the speed of the second conveyance illustrated in FIG. 2. This voltage is applied to the speed regulator 22 on one hand, and to the voltage-to-frequency converter 13, on the other hand.

The high frequency voltage of the transmitter 1 is frequency modulated by means of the modulator 14. The connection 7 supplies the frequency-modulated high frequency carrier to the high frequency line 3. The latter transmits the signal to the following conveyance.

In the same manner as described above, a frequency modulated high-frequency voltage is transmitted from the first conveyance preceding the conveyance illustrated in FIG. 2 to the high frequency line 3 and received by the receiver 2 in the second conveyance over the connection 8. The demodulator 17 and frequency -to-voltage converter 18 deliver the high frequency voltage received by the receiver 2 to the subtractor 4. A rectifier 23 supplies the high frequency signal from the receiver 2 to the multiplier 5.

The subtractor 4, which also receives the theoretical nominal value v_{2N} of the speed of the second conveyance from a nominal value transmitter 24, forms a value corresponding to the difference $v_{2N} - v_{1A}$. The multiplication member 5 multiplies the difference $v_{2N} - v_{1A}$ by the quantity e^{-ax_d} arriving from the rectifier 23. This creates the control quantity $v_{2C} = e^{-ax_d}(v_{2N} - v_{1A})$. The subtractor 6 receives the control quantity $v_{2C} = e^{-ax_d}(v_{2N} - v_{1A})$ so that it is superimposed on the theoretical nominal value v_{2N} of the speed of the second conveyance. The output of the subtractor 6 is finally connected to the speed regulator 22. That is, the speed regulator receives not the theoretical nominal value v_{2N} of the speed of the second conveyance, but rather the value $v_{2C} = e^{-ax_d}(v_{2N} - v_{1A})$, as an actual desired value.

As an additional explanation to the above-mentioned quantity e^{-ax_d} arriving from the rectifier 23, the following should be noted: As has already been pointed out, the factor e^{-ax_d} is obtained by utilizing the law of propagation of high frequency voltages on the homogeneous high frequency line 3. Thus, each quantity (DC voltage) from the rectifier 23 supplied to the multiplication member 5 necessarily incorporates the factor e^{-ax_d} since this quantity is proportional to the amplitude of the high frequency voltage supplied to the rectifier.

Finally, it should be noted that the retardation or delay b in the term $\sqrt{2}(x_{max} - x_d)b$ is a deceleration of the dimension m/sec^2 .

While an embodiment of the invention has been described in detail, it will be obvious to those skilled in the art that the invention may be embodied otherwise without departing from its spirit and scope.

What is claimed is:

1. The method of maintaining the distance between two conveyances moving at predetermined nominal speeds along an electric line having a given electrical characteristic along its length, which comprises sensing the actual speed of the first conveyance in the second conveyance, detecting the distance between the two conveyances as a function of the characteristic of the line along which the conveyances travel, deriving a control quantity from the sensed value of the speed of the first conveyance and the detected distance between the conveyances, deriving an additional quantity representing the nominal speed of the second conveyance, and controlling the speed of the second conveyance by superimposing the control quantity on the nominal speed of the second conveyance.

2. The method as in claim 1, wherein the control quantity is determined according to the equation

$$V_{2C} = e^{-ax_d}(V_{2N} - V_{1A})$$

where e equals the base of natural logarithms, x_N is the nominal distance between the two conveyances,

x_d is the distance between the two conveyances exceeding the nominal value x_N ,

a is a constant,

v_{2C} is the control quantity,

v_{2N} is the nominal value of the speed of the second conveyance, and

v_{1A} is the actual value of the speed of the first conveyance.

3. The method as in claim 2, wherein the step of sensing the actual speed includes the steps of coupling each of the conveyances to the line, propagating a high-frequency voltage in the first conveyance along the line, and receiving the propagated voltage in the second conveyance, and wherein the step of detecting the distance between the two conveyances includes deriving a factor e^{-ax_d} in response to the attenuation of the transmitted voltage.

4. The method as in claim 2, wherein the step of propagating the high frequency voltage includes forming a high impedance block along the line between a rear transmitter and a forward receiver of the same conveyance so as to permit propagation of the signals only in one direction along the line.

5. The method as in claim 2, wherein the step of determining the speed of the first conveyance includes modulating the high frequency voltage transmitted along the line in the first conveyance and receiving and demodulating the frequency modulated high frequency voltage in the second conveyance.

6. The method as in claim 4, wherein the step of determining the speed of the first conveyance includes modulating the high frequency voltage transmitted along the line in the first conveyance and receiving and demodulating the frequency modulated high frequency voltage in the second conveyance.

7. An apparatus for controlling the speed of one of a plurality of conveyances travelling so as to follow one another along a line having a known electrical attenuation characteristic, comprising transmitter means on said one conveyance responsive to the speed of the one

conveyance and coupled to the line for generating a high-frequency signal modulated according to the speed of the one conveyance and for applying the signal along the line in the direction of a following conveyance, receiver means on the one conveyance and coupled to the line for receiving high-frequency signals from a preceding conveyance, signal-producing means on the one conveyances and coupled to said receiver means for generating a control signal dependent upon the modulation of the signal received and the effect imposed upon the signal received by the characteristic of the line, and regulating means on the one conveyance and coupled to said signal-producing means for regulating the speed of the one conveyance.

8. An apparatus as in claim 7, wherein said transmitter means includes modulating means on the one conveyance responsive to the speed of the one conveyance, for modulating the signal transmitted by said transmitter means in response to the speed of the one conveyance.

9. An apparatus as in claim 8, wherein said signal-producing means includes a demodulating portion for producing an indication dependent upon the modulation of the signal received and indicating the speed of the preceding conveyance.

10. An apparatus as in claim 9, wherein said one conveyance has a nominal speed, said signal-producing means including subtracting means for producing a subtract signal corresponding to the differences of the indications and the nominal speed of the one conveyance, signal generating means coupled to said receiver means for generating an exponential signal responsive to the effect imposed by the line on the characteristic of the line, and multiplying means connected to said signal generator means and said subtracting means for multiplying the subtract signal with the exponential signal to produce the control signal.

11. An apparatus as in claim 7, wherein said transmitter means includes a transmitter and transmitter coupling means for coupling said transmitter to the line, and wherein said receiver means includes a receiver and receiver coupling means for coupling the receiver to the line.

12. An apparatus as in claim 10, wherein said transmitter means includes a transmitter and transmitter coupling means for coupling the transmitter to the line, and wherein said receiver means includes a receiver and receiver coupling means for coupling the receiver to the line.

13. An apparatus as in claim 11 wherein said conveyance has a predetermined nominal speed, and wherein said signal-producing means includes nominal speed generating means for generating a value corresponding to the nominal speed of conveyance, said nominal speed generating means applying the value to said subtracting means to represent the nominal speed of the conveyance.

14. An apparatus as in claim 11, further comprising capacitor means connected between said coupling means, the line having a distributed inductance, said coupling means being spaced from each other along the line, said capacitor means being tuned with the distributed inductance of the line to form a parallel resonant circuit tuned to the frequency of the signal generated by said transmitter means, whereby said capacitor means and the distributed inductance form a high im-

pedance to signals transmitted by the transmitter means along the line.

15. An apparatus as in claim 14, wherein said conveyance has a predetermined nominal speed, and wherein said signal-producing means includes nominal speed generating means for generating a value corresponding to the nominal speed of the conveyance, said nominal speed generating means applying the value to said subtracting means to represent the nominal speed of the conveyance.

16. An apparatus as in claim 13, wherein said modulator means further includes a voltage-to-frequency converter connected to said speed sensing means and a modulator responsive to said voltage-to-frequency converter and connected to said transmitter means for modulating said transmitter means, said demodulating means including a demodulator connected to said receiver means and a frequency-to-voltage converter responsive to said demodulator and connected to said subtracting means.

17. An apparatus as in claim 11, further comprising negative feedback means connecting said transmitter means to said receiver means.

18. An apparatus as in claim 11, further comprising power supply means for energizing the conveyance, said power supply means including a neutral conductor, said neutral conductor constituting a portion of said line, a high frequency bar forming a portion of the line.

19. An apparatus as in claim 17, wherein said bar is made essentially of iron having a conductance of about 10 and a permeability of about 1500.

20. An apparatus as in claim 19, wherein said conveyance has a predetermined nominal speed, and wherein said signal-producing means includes nominal speed generating means for generating a value corresponding to the nominal speed of the conveyance, said nominal speed generating means being connected to said subtracting means for supplying the value as representative of the nominal speed of the conveyance.

21. A transport system, comprising a path along which conveyances can travel, a plurality of conveyances aligned to travel serially along the path, a high-frequency line having a predetermined characteristic extending along the path; said conveyances each including transmitter means responsive to the speed of the conveyance and coupled to the line for generating high-frequency signals modulated according to the speed of the conveyance along the line in the direction of a following conveyance, receiver means coupled to the line for receiving the modulated high-frequency signal from a preceding conveyance, signal-producing means coupled to the receiver means for generating a control signal dependent upon the modulation of the signal received and the effect imposed upon the signal received by the characteristic of the line, and regulating means coupled to said signal-producing means for regulating the speed of the conveyance; said line being a homogeneous high-frequency line.

22. A system as in claim 21, wherein said transmitter means in each of said conveyances includes modulating means responsive to the speed of the conveyance for modulating the transmitter means in accordance with the speed of the conveyance.

23. A system as in claim 22, wherein said modulating means includes a frequency modulator, and wherein

said demodulating means includes a frequency demodulator.

24. An apparatus as in claim 22, wherein respective capacitor means connect each of said transmitter means to the receiver means in each of said conveyances, said capacitor means forming with the distributed inductance of said line a parallel resonant circuit tuned to the carrier frequency transmitted by said transmitter means.

25. A system as in claim 22, wherein said line includes a conductor and a high frequency bar.

26. A system as in claim 25, wherein said bar is composed of iron having a conductance of about 10 and a permeability of about 1500.

27. A system as in claim 21, wherein said signal-producing means includes demodulating means for producing an indication responsive to the modulation of the received signal and representing the speed of the previous conveyance.

28. An apparatus as in claim 27, wherein each of said conveyances is assigned a nominal value of speed; and wherein said signal-producing means include subtracting means for producing a subtract signal corresponding to the differences of the indication and the nominal speed of the conveyance, signal generating means coupled to said receiver means for generating an exponential signal responsive to the effect imposed on the line by the characteristic of the line, and multiplying means connected to said signal generating means and said subtracting means for multiplying the subtract signal with the exponential signal to produce the control signal.

29. An apparatus as in claim 28, wherein each of said conveyances has a predetermined nominal speed, and wherein in each of said conveyances said signal producing means includes nominal speed generating means for generating a value corresponding to the nominal speed of the conveyance, said nominal speed generating means applying the value to said subtracting means to represent the nominal speed of the conveyance.

30. A system as in claim 29, wherein in each of said conveyances said transmitter means includes modulator means and said modulator means includes sensing means for sensing the speed of the conveyance and pro-

ducing a voltage therewith and voltage to frequency converter means for producing a frequency modulating signal corresponding to the speed of the conveyance.

31. A system as in claim 21 wherein said transmitter means includes a transmitter portion and coupling means for coupling the transmitter to the line, said receiver means including a receiver portion and coupling means for coupling the receiver to the line, a capacitor connected between the coupling means and forming a resonator with the high-frequency line having a resonance frequency between the coupling means corresponding to the frequency being transmitted by said transmitter means.

32. An apparatus as in claim 22, wherein said modulator means includes speed-sensing means responsive to the speed of the conveyance for producing a voltage corresponding to the speed of the conveyance and voltage-frequency converter means for producing a signal having a frequency corresponding to the speed, said converter means being connected to modulate the signal from said transmitter means.

33. A system as in claim 21, wherein the high-frequency line includes a neutral conductor and a high-frequency bus bar.

34. An apparatus as in claim 30, wherein said high-frequency line includes a neutral conductor and a high-frequency bus bar.

35. An apparatus as in claim 33, wherein the high-frequency bus bar is composed of iron with a conductance of about 10 Sm/mm² and a relative permeability μ of about 1500.

36. A system as in claim 31, wherein the high-frequency bus bar is composed of iron with a conductance of about 10 Sm/mm² and a relative permeability μ of about 1500.

37. A system as in claim 21, further comprising feedback means in each of said conveyances between said transmitter means and said receiver means.

38. An apparatus as in claim 30, further comprising feedback means connecting said transmitter means and said receiver means.

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