A noise suppression system for a railway classification yard is disclosed. An oil-in-water emulsion consisting essentially of one part of oil and ten parts of water is sprayed against the rail car wheels as they enter the master retarder. Additional spray means are provided at the group retarders for spraying additional emulsion against the wheels of heavily loaded cars as they enter the group retarders. The oil-in-water emulsion eliminates the squealing of the car retarders with only a minor reduction in braking efficiency.

13 Claims, 8 Drawing Figures
FIG 7

FIG 8
NOISE SUPPRESSION SYSTEM FOR CAR RETARDERS

BACKGROUND OF THE INVENTION

This invention relates to a noise suppression system for use in a railway classification yard. Specifically, it eliminates the squeal caused by metal to metal contact when the brake shoes of the master and group retarders exert a braking action against the wheels of the incoming railway cars.

Car retarders are employed in railway classification yards in conjunction with a "hump" over which a string of cars is pushed. The cars are then individually, or in cuts, allowed to accelerate down the hump and through the appropriate switching networks to their ultimate destination. As the cars accelerate down the hump, it is necessary to keep the speed of travel within certain predetermined levels in accordance with their rolling resistance, distance to be travelled before coupling, and various other factors.

Since light cars generally have the greatest rolling resistance and thus must be given the greatest acceleration to reach the most distant destination in the classification yard, the hump is built high enough to cause light cars to reach sufficient speed to carry them to the furthest point. Car retarders are then added to reduce the speed of the heavier cars. The first retarder is employed on the main track downstream of the hump but before the track divides into the classification branches. This main retarder is known as the master car retarder, and the retarders that are placed on the individual branch lines are known as group retarders.

Each of these retarders employ a pair of elongated brake shoes on either side of each rail which come together to grip the wheels of the rail car and cause a partial braking of the car's movement. The steel-on-steel friction generated by the car retarder at the substantial loads imposed by the retarder results in a loud and offensive squeal each time the retarder engages a railway car. The present invention is particularly adapted to eliminate the squeal with only a minimal amount of reduction in braking efficiency.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a noise suppression system which will eliminate the squeal of a railway car retarder by spraying the wheels of the railway car with an oil-in-water emulsion as the car passes through the retarder. The emulsion consists essentially of one part of lubricating oil to ten parts of water and provides sufficient lubrication to eliminate the "chatter" or vibration which results in the squealing noise without substantially impairing the braking efficiency of the car retarder. In actual practice, the squeal is eliminated with only a 6 percent reduction in braking efficiency.

A plurality of spray means is mounted immediately adjacent each of the braking shoes in the master retarder to spray the oil-in-water emulsion against the wheels of the railway car as it passes through the master retarder. A car detector means energizes and deenergizes the spray means for the master retarders. The group retarder spray means are activated when an exceptionally heavy car is cut through one of the group retarders. In actual practice, it has been found advanta-
in-water emulsion against the rail car wheel as illustrated in FIG. 5. In the preferred embodiment, one-half inch pipes 72 and 73 are mounted on either side of the rail by means of a plurality of spring clips 74 and 75 which extend over the pipe 73 and down through an opening 76 defined in the webs of the beams 52 and 53 to clamp said pipes against said beams. The pipe itself rests upon the upstanding ribs 56–62 of beam 52. The resilient nature of clamps 74 and 75 ensures that the pipes 72 and 73 are held securely in place. Each of the pipes 72 and 73 is equipped with a plurality of spray nozzles. These spray nozzles 77–83 for pipe 72 and nozzles 84–90 for pipe 73 are aligned to provide a continuous bath of oil-in-water emulsion on either side of the rail 91. The diverging nature of the sprays, and the curved portions 72a and 73a provide angled sprays which will thoroughly wet both the flange 92 and the rim 93 of the rail car wheel. The curved portions 72a and 73a also ensure the spacing between the individual retarder sections is controlled. Since the brake shoes are brought to bear against the rim on one side and the flange on the other, it is necessary that both surfaces receive the proper amount of lubrication. The 1:10 ratio or mixture of oil and water has been found to provide the proper degree or amount of lubrication when the rail car wheels are thoroughly wetted with the emulsion.

FIGS. 2 and 3 are diagrammatic views of the complete retarder with some of the detail omitted for purposes of clarity. FIG. 2 illustrates a plurality of elongated braking shoes 101–120 mounted on either side of each rail 121 and 122. Each of these braking shoes is supported by the respective support or retarder beam 101a–120a. The beams in turn support spray pipes 121–140 which are secured to the beams in the manner illustrated in FIGS. 5 and 6. The pipes are connected together by means of rubber hose connectors 121a–140a. These connector hoses provide the requisite flexibility for the spray pipes since each section is individually operated. They also provide for the relative expansion between the various members due to extreme temperature variation. The spray pipes 121–140 are connected to the fluid supply system by means of manifold 141 which extends perpendicularly to the tracks 121 and 122 and intersects the spray pipes 121–140 at a convenient midpoint. The midpoint is selected to minimize the problems associated with pressure drop across the respective lengths of piping 121–140. Each of the terminal ends of spray pipes 121–124 and 137–140 is equipped with caps to seal the ends of the spray pipes and to prevent the discharge of emulsion therefrom.

The retarder illustrated in FIG. 2 is illustrated in elevation view in FIG. 3. As indicated previously, the retarders are generally placed on the slant of a "hump" to assist in regulating the speed of a railway car after it passes over the hump and is routed to its preselected destination. The individual retarder beams 104a–120a are supported by a plurality of wooden railway cross ties 142–150. These cross ties are in turn supported by a concrete basin or sump illustrated generally by numeral 151. This sump provides a collection point for the excess emulsion sprayed against the car wheels as they pass through the retarder. As was previously described in FIG. 1, the emulsion 152 collected in the lower portion of the sump is routed back to the mixing.
The fluid mixing and handling system for supplying the oil-in-water emulsion is illustrated in FIGS. 7 and 8. FIG. 7 is a cross-sectional and elevation view of the storage tank provided at each of the retarders. FIG. 8 is a cross-sectional and elevation view of the mixing means for preparing the oil-in-water emulsion.

As illustrated in FIG. 8, the mixing means comprises a water inlet 201, an oil inlet 202, and a discharge outlet 203 for discharging the oil-in-water emulsion. The tank 204 is sized to accommodate the total volume of all the retarder storage tanks. The incoming solution from conduit 40 is first filtered by filter means 205 and then pumped by means of pump 206 into the mixing tank 204. This pump is actuated whenever the liquid level in the mixing tank drops below a certain predetermined level. This predetermined level is established by the position or placement of the detector 207 mounted in the wall of the mixing tank 204. While pump 206 is actuated, it drains the emulsion from each of the retarder sumps and recycles the filtered emulsion for reuse in the system. In the preferred embodiment, a large percentage of the liquid is recovered and recycled for reuse in the system. In the event there is no solution available in the retarder sumps to fill the mixing tank 204, the mixing controller 208 will open the water control valve 209 and allow a predetermined quantity of water to be admitted to the mixing tank 204.

A second detector 210 is placed within the mixing tank 204 to determine the level where the maximum addition of soluble oil will fill the tank if the solution is pure water. When detector 210 has indicated that the requisite amount of water has been supplied to the mixing tank 204, it will close valve 209 and energize the refractometer 211 to analyze the solution 212 in the mixing tank 204. At the same time, the mixing means 213 will be energized by drive means 214 to thoroughly mix the existing emulsion with the incoming water. After a suitable time delay, the refractometer will analyze the percentage of oil and water and provide a representation signal to the master controller 208. The master controller 208 will then open the lubricant control valve 215 to allow the proper amount of oil to enter the mixing tank 204. Detector 216 senses the maximum quantity of emulsion desired in the mixing tank 204. It also operates as a high limit or upper limit control in the event of failure of one of the other components.

The automatic analysis of the emulsion 212 is also necessary since substantial amounts of rain water will be collected in the sump basins 151 and the mixture pumped from the retarder sumps may have a vastly altered oil to water mixture ratio. In the event a substantial amount of fresh water has been added to the system, pump 206 will fill the mixing tank to the level indicated by detector 210. At that time, the mixture will be analyzed by refractometer 211 and if additional oil is needed to bring the mixture to the proper ratio, valve 215 will be open, and the appropriate amount of oil will be added to the solution. Although the emulsion is extremely stable, it may be desirable to have the mixing means 213 continuously rotating within the tank 204. This would ensure that the lubricant and oil do not separate. The solution is drawn from the mixing tank 204 to each of the retarder storage tanks by means of pumps 36, 45, 46 and 47. The storage tank for retarder 12 is illustrated in FIG. 7 wherein pump 36 draws the mixture from the mixing tank to the storage tank 37. A pair of liquid level indicators 217 and 218 provide low level and upper level limit indicators for the amount of solution stored in tank 37. When the amount of solution has dropped below the level predetermined by level indicator 217, the control means 219 energizes pump 36 and withdraws the appropriate amount of solution from tank 204 to fill the local storage tank 37. When the level of the solution reaches the level indicated by level indicator 218, pump 36 is deenergized.

The solution is withdrawn from storage tank 37 through conduit 220 by means of pump 22. Pump 22 is actuated by controller 19 whenever the car detector 21 senses a railway car entering the master retarder. After the car has left the retarder, pump 22 is deenergized by the car detector 20.

The emulsion provided by the fluid mixing and handling system is an oil-in-water solution consisting essentially of a lubricating oil and water. It has been found that a mixture of Texaco type 1609, class 38 soluble heavy duty oil, mixed ten parts of water to one part of oil will eliminate the noise and squeal of the normal car retarder but will only reduce the braking efficiency by approximately 6 percent.

In a first test of the retarder noise suppression system, a mixture of 20 parts of water to 1 part of soluble oil was used with only partial abatement of the noise. Of ten cars that passed through the retarder, two generated substantial noise when the retarders were actuated.

In a second test of the solution, that being 10 parts of water for 1 part of oil, all the cars passed through the retarder without any excessive noise or squealing and the effective retardation was diminished by only 6 percent.

In a third test, a mixture of 5 parts of water to 1 part of oil was employed and the noise was totally eliminated; however, the retarder efficiency was substantially reduced.

The mixture of oil and water appears thoroughly emulsified. The Texaco 1609 class 38 soluble heavy duty oil is reddish in appearance, but when mixed with 10 parts of water to 1 part of oil provides a milky, almost opaque solution.

While there has been described what at present is considered to be the preferred embodiment of the present invention, it would be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention. For example, it would be possible to interchange the liquid level detectors 207, 210, 216, 217 and 218 with continuous line level indicators to provide an analog output. Additionally, the refractometer 211 could continuously analyze the solution 212 to continuously adjust the oil and water mixture present in the mixing tank 204.

Having thus described a noise suppression system in one specific embodiment, it is understood that this form is selected to facilitate the disclosure of the invention rather than to limit the number of forms which it may assume. It is further understood that various modifications, adaptations, and alterations may be applied to the specific form shown to meet the requirements of practice, without in any manner departing from the sphere of scope of the following appended claims.

I claim:

1. A noise suppression system for car retarders comprising
a car retarder for partially braking a rail car, said retarder comprising a pair of elongated braking shoes mounted on either side of each rail, said elongated shoes being mounted on a support base and movable into and out of engagement with the wheels of the rail car when partial braking is desired,
b. a plurality of spray means mounted on said support base for spraying an oil-in-water emulsion against said rail car wheels, said emulsion consisting essentially of lubricating oil and water,
c. detector means for detecting the presence of a rail car and energizing said spray means.

2. A noise suppression system for car retarders as claimed in claim 1 wherein said retarder comprises a plurality of elongated braking shoes on either side of each rail, each of said braking shoes being provided with a plurality of spray nozzles for spraying said emulsion against said rail car wheels.

3. A noise suppression system for car retarders as claimed in claim 1 which further comprises a concrete basin which surrounds and supports said car retarder, said basin providing a collection sump for the emulsion sprayed by said spray means.

4. A noise suppression system for a rail classification yard, said system comprising
a. a master car retarder for partially braking a plurality of rail cars, said master retarder comprising a pair of elongated braking shoes mounted on either side of each rail, said master retarder also comprising a detector means for detecting the presence of a rail car, and weigh detector means for determining the weight of a rail car as it passes through said master retarder,
b. at least one group retarder for partially braking at least one rail car, said group retarder comprising a pair of elongated braking shoes mounted on either side of each rail, said group retarder also comprising detector means for detecting the presence of a rail car,

c. a plurality of spray means mounted on each of said group retarders and said master retarder for spraying an oil-in-water emulsion against the wheels of a rail car, said emulsion consisting essentially of a lubricating oil and water,
d. control means for actuating said spray means mounted on said master retarder as said car is passed through the master retarder, and selectively activating the spray means mounted in said group retarder when said rail car exceeds a certain predetermined weight.

5. A noise suppression system for a rail classification yard as claimed in claim 4 wherein each of said retarders is mounted in a concrete basin, said basin defining a collection sump for said emulsion after it has been sprayed against said rail car wheels.

6. A noise suppression system for a rail classification yard as claimed in claim 4 which further includes a fluid mixing and handling system to prepare and supply the oil in water emulsion, said means comprising a water inlet, an oil inlet, means for mixing said emulsion, and discharge means for conveying said solution to said spray means.

7. A noise suppression system for car retarders comprising
a. a car retarder for partially braking a rail car, said retarder comprising a pair of elongated braking shoes mounted on either side of each rail, said elongated shoes being mounted on a support base and movable into and out of engagement with the wheels of a rail car when said partial braking is desired,
b. a plurality of spray means mounted on said support base for spraying an oil-in-water emulsion against said rail car wheels, said emulsion consisting essentially of a lubricating oil and water,
c. detector means for detecting the presence of a rail car and energizing said spray means.

d. mixing means for preparing and supplying said oil and water emulsion, said means comprising a water inlet, an oil inlet, means for mixing said emulsion, and discharge means for conveying said solution to said spray means.

8. A noise suppression system for car retarders as claimed in claim 7 which further comprises storage means for receiving the oil in water emulsion from said mixing means, said storage means having a liquid level means for withdrawing said emulsion from said mixing means when the level of emulsion in said storage means has dropped below a certain predetermined level, said storage means also comprising means for supplying said emulsion to said spray means.

9. A noise suppression system for car retarders as claimed in claim 7 which further comprises a control means for activating said water inlet and said oil inlet and energizing said mixing means when said liquid level means indicates the emulsion in said mixing means has dropped below a predetermined level.

10. A noise suppression system for car retarders as claimed in claim 8 which further comprises refractometer means for measuring the relative proportion of oil and water in said mixing means.

11. A fluid mixing and handling system for supplying a lubricating emulsion to a railway car retarder comprising
a. a car retarder means for braking the wheels of a rail car,
b. spray means mounted on said car retarder for supplying an oil-in-water emulsion against a rail car wheel, said emulsion consisting essentially of a lubricating oil and water,
c. mixing means for preparing and supplying an oil and water emulsion, said mixing means comprising a water inlet, an oil inlet, means for mixing said emulsion and outlet means for discharging said emulsion,
d. storage means for receiving the emulsion from said mixing means and supplying said emulsion to said spray means, said storage means also having a liquid level means mounted therein for indicating when the level of said emulsion has dropped below a certain predetermined level,
e. control means for receiving signals from said liquid level means and energizing means to withdraw additional emulsion from said mixing means.

12. A fluid mixing and handling system for supplying a lubricating emulsion to a railway car retarder as claimed in claim 11 wherein said mixing means further includes refractometer means to determine the proportion of oil and water being mixed in said mixing means.

13. A fluid mixing and handling system for supplying a lubricating emulsion to a railway car retarder as claimed in claim 12 which further comprises control valves for said water inlet and said oil inlet, said control means responsive to said refractometer means to open and close said oil and water valves to achieve a predetermined proportion of oil and water in said mixing means.