

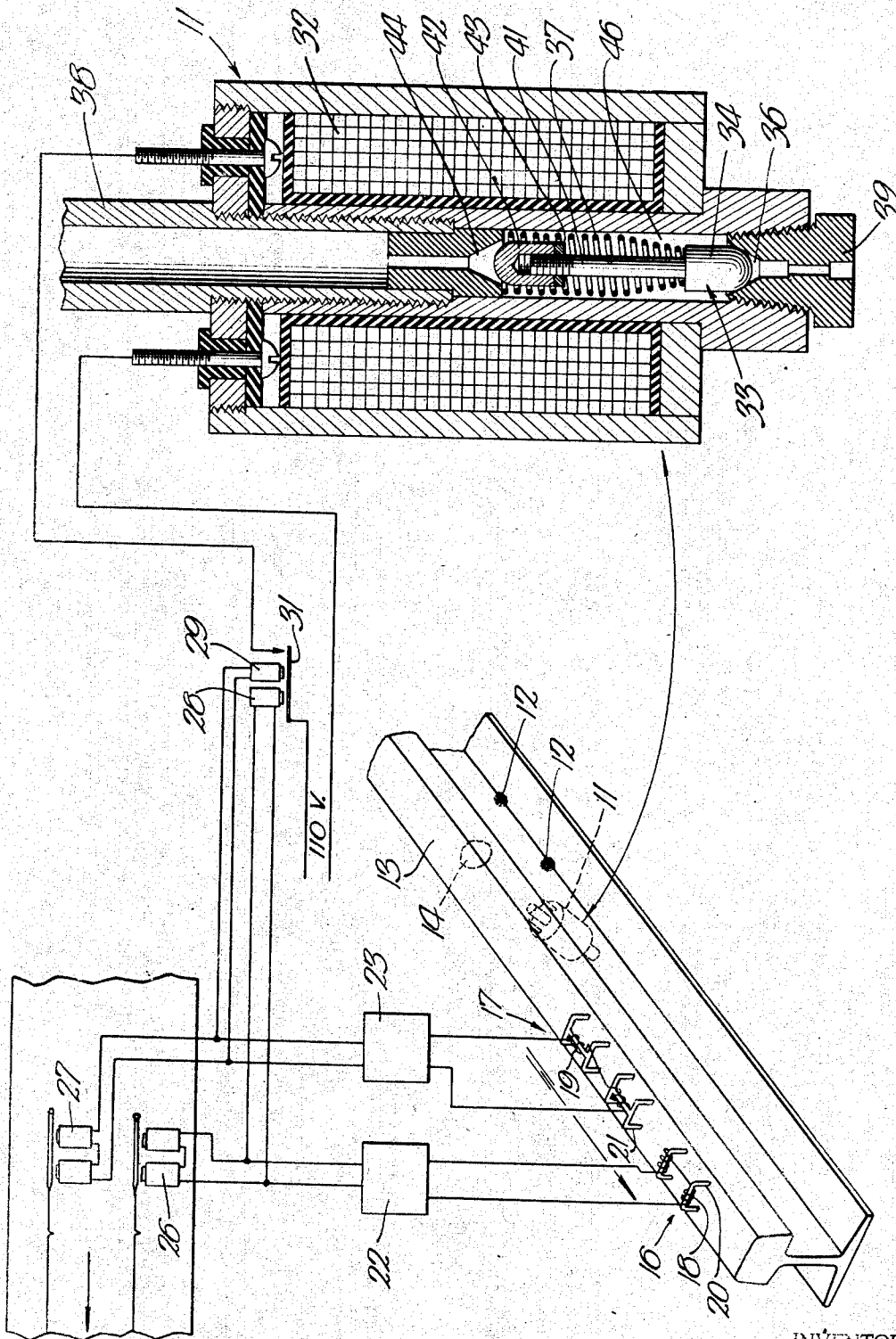
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PAINT GUN

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PAINT GUN

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In detecting hidden flaws in the rails of a railroad track it is the present practice to run a car along the track with detecting equipment which includes a paint gun that automatically shoots a spot of paint on the rail adjacent a flaw. For various reasons it is desirable that the spot of paint applied by the gun be reasonably small, say in the neighborhood of one and one-half inches in diameter or smaller. Heretofore it has been necessary to rely either upon a complicated metering device or upon a very short actuating impulse for the gun. However, it has sometimes been difficult to make the actuating impulses sufficiently short, and therefore the paint spots have sometimes been undesirably large.

Small spots are very desirable for the purpose of showing flaws which are close to another flaw or a rail joint, since large spots would be merged together and appear as one. The need for some further means for limiting the size of the paint spots has been increased by the provision of two detector circuits, both operating the same paint gun, with the result that the gun would shoot two spots for each fissure instead of one. This increases the chance that the spots for two different fissures will be merged with resulting confusion.

It has been the practice heretofore to operate the valve of the paint gun magnetically, the gun being surrounded by a solenoid coil and the valve and its shank being magnetic and being positioned to be drawn open by the solenoid. According to the present invention, the solenoid impulse does not merely draw the valve open and then permit it to be closed by a spring, remaining open during the entire movement back and forth; instead, it provides a supplemental valve which is closed by the opening movement of the main valve so that a continuous flow from the time the main valve opens until it is again closed is prevented. The two valves are mounted on opposite ends of a single reciprocating shank and one of them is adjustable thereon so that the length of stroke between the opening of one valve and the closing of the other may be regulated. This facilitates adjustment of the approximate maximum size of the paint spot. Reference is made to the "approximate maximum" size of paint spot because of the fact that varying conditions such as temperature, viscosity of the paint, and air pressure applied to it will result in substantial variations in the size of the paint spot even when other factors are constant.

Additional advantages and objects of the invention will be apparent from the following description and from the drawing, in which:

The figure is in part a circuit diagram and in part a longitudinal sectional view of a paint gun constructed in accordance with this invention, the approximate position of the paint gun adjacent the rail being shown on a smaller scale in another part of the figure.

A preferred form of the invention has been chosen for illustration and description, in compliance with section 4888 of the Revised Statutes, but persons skilled in the art will readily perceive other means for accomplishing the same results, and the claims are therefore to be construed as broadly as possible, consistent with the prior art.

In the figure the invention has been illustrated diagrammatically except for the construction of the paint gun 11, which is shown in detail. As seen at the left-hand portion of the figure, the paint gun is intended for the purpose of shooting spots of paint 12 on a rail 13 adjacent a hidden flaw 14, which is detected by either of the detecting units 16 or 17. Each of the detecting units comprises a pair of coils 18 and 19 respectively, mounted on suitable cores 20 and 21, respectively, which are moved lengthwise along the rail immediately adjacent to the top thereof. According to one system of detection, a current is passed through the rail and the deflection of the current by the flaws causes an impulse to be generated in the coils 18 and 19 as they pass over the flaw. According to another system, the rail is first magnetized and then the magnetizing force is removed with the result that, in effect, the flaws are polarized and as a result an impulse is generated in the coils 18 and 19 as they pass over the flaw. The coils 18 and 19 are connected to amplifying units 22 and 23 respectively. These amplifying units are connected respectively to pen relays 26 and 27 and to paint gun relays 28 and 29. The pen relays 26 and 27 actuate separate pens but the paint gun relays 28 and 29 operate a single paint gun and in fact may operate a single armature 31. The armature 31 closes a circuit connecting the paint gun 11, or, more specifically, its solenoid coil 32, to a source of power such as a 110-volt generator. The coil 32 operates a plunger 33 formed of magnetic metal and including the valve head 34 which, when not actuated by the coil 32, closes the outlet valve port 36, being pressed against the seat thereof by spring 37. The magnetic force gen-

erated by the coil 32 retracts the plunger 33, thus opening the port 36 so that paint supplied through conduit 38, under pressure from a source of compressed air, not shown, shoots out through the port 36 and the nozzle 39 to form a spot of paint 12 on the rail 13.

The two spots of paint shown on the Figure 25 are caused by a single flaw 14 as the successive detector units 16 and 17 pass over it. It is evident that if another flaw were close to the flaw 14 or if the flaw 14 were close to a rail joint, additional spots of paint might be applied so close to one of the spots 12 shown that the two would merge and it would be difficult to tell whether there was one spot or two. The larger the spots 12, the more likely they are to merge. Hence, although there is no necessity for having them always an exact size, it is desirable to keep them reasonably small. If the armature 31 were held closed for a substantial length of time and paint were allowed to flow freely through the port 36 during all the time that the armature 31 was closed, the resulting paint spot would be much too large. Heretofore there have been various proposals for avoiding this difficulty by various expedients such as accurately controlling the length of time during which the circuit to the coil 32 could be closed or accurately metering the amount of paint which would be expelled. According to the present invention the problem is solved in an entirely different and much simpler method by providing a double acting plunger 33 which shuts off the flow of paint very quickly after opening the valve port 36.

To this end the plunger 33 comprises, in addition to the valve head 34, a shank or stem 41 to which it is secured and a second valve head 42 screwed on the shank 41 and preferably locked in a given position thereon by a lock nut 43. As the coil 32 retracts the plunger 33, raising the valve head 34 from its valve seat, it thrusts the valve head 42 against an inlet valve seat 44, thus closing the inlet valve. No more paint will flow no matter how long the circuit for the coil 32 remains closed and hence there is no danger of having the paint spots 12 excessively large.

It might be supposed that when the coil 32 is de-energized, another shot of paint would be expelled from the paint gun as the plunger 33 moved from the inlet-closing position to its normal position in which it closes the outlet port or valve 36. A gun made in accordance with this invention has been in practical use, however, and apparently there is only one shot of paint for each energization of the coil 32. The probable explanation of this is that enough of the paint flows out when the plunger is raised so as to leave a little air space within the valve chamber 46 or the passage through the nozzle 39 with the result that when the plunger 33 shifts back very quickly as a result of the combined effect of the pressure of spring 37 and the fluid pressure behind it, the paint barely has time to fill the space and it does not have time to shoot past the plunger 33 and discharge through the nozzle 39.

The length of time during which the inlet and outlet ports 44 and 36 are both open can be regulated by adjusting the valve head 42 on the stem 41, locking it in its adjusted position by lock nut 43. The separation of the two valve heads determines the length of stroke of the plunger and hence the length of time during which both valves are open. Since both valves are open for only a short time, the paint spot is

dependably small. Although it is not of a uniform size, since its size depends on the air pressure and viscosity of the paint, it has nevertheless been found to make completely unnecessary the metering devices which have sometimes been used and which are considerably more expensive.

The gun of this invention has been found to be very satisfactory. It is economical to manufacture and satisfactorily restricts the size of the paint spots to a reasonable size while at the same time making completely unnecessary any special electrical or mechanical features tending to accurately time the closure of the circuit or accurately measure and segregate the amount of paint to be discharged.

I claim:

1. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having aligned inlet and outlet valve seats, means for supplying paint to the chamber through the inlet seat, a magnetically operated plunger within the valve chamber having a valve on each end thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a coil surrounding the valve chamber for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, one of said valves being adjustably positioned with respect to the other to control the length of stroke between the opening of one valve and the closing of the other.

2. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having aligned inlet and outlet valve seats, means for supplying paint to the chamber through the inlet seat, a magnetic plunger within the valve chamber having a valve on each end thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a coil surrounding the valve chamber for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve.

3. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having aligned inlet and outlet valve seats, a magnetic plunger within the valve chamber having a valve on each end thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a coil surrounding the valve chamber for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, the closing of the inlet valve seat operating to cut off from the valve chamber all supply of pressure above atmospheric pressure.

4. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having aligned inlet and outlet valve seats, a magnetic plunger within the valve

chamber having a valve on each end thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a coil surrounding the valve chamber for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, the closing of the inlet valve seat operating to cut off from the valve chamber all supply of pressure above atmospheric pressure, one of said valves being adjustably positioned with respect to the other to control the length of stroke between the opening of one valve and the closing of the other and the amount of paint that will be discharged under given conditions of viscosity, pressure, and magnetic force.

5. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having alined inlet and outlet valve seats, a magnetic plunger within the valve chamber having a valve on each end thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a coil surrounding the valve chamber for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, the magnetic plunger comprising a rod and the valve at one end thereof being threaded on said rod to be adjustable with respect thereto, and a lock nut threaded on said rod ahead of said valve to screw against said valve for locking it in a given adjusted position.

6. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having alined inlet and outlet valve seats, means for supplying paint to the

chamber through the inlet seat, a magnetically operable plunger within the valve chamber having a pair of valves facing outwardly from an intermediate point thereof, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and a magnetic coil for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, one of said valves being adjustably positioned with respect to the other to control the length of stroke between the opening of one valve and the closing of the other.

7. A paint gun for applying a spot of paint of approximately limited size to a rail adjacent a flaw therein, comprising a main body forming a valve chamber having only two openings therefrom, said openings being formed in generally opposed inlet and outlet valve seats, a magnetic plunger within the valve chamber having generally opposed valves adapted to close said openings alternatively, a spring normally pressing one valve into closing and sealing engagement with the outlet valve seat, the other valve being positioned adjacent to but spaced from the inlet valve seat, and magnetic means for shifting the plunger to move one valve away from the outlet valve seat and with the same stroke close the inlet valve seat with the other valve, the closing of the inlet valve seat operating to cut off from the valve chamber all supply of pressure above atmospheric pressure, and means for adjusting the relationship between the spacing of the valves and the spacing of the valve seats to control the length of stroke between the opening of one valve and the closing of the other and the amount of paint that will be discharged under given conditions of viscosity, pressure, and magnetic force.

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