Feb. 2, 1971 J. A. PETERSON 3,559,344

AIR PRESSURE GUN

Filed Jan. 25, 1968

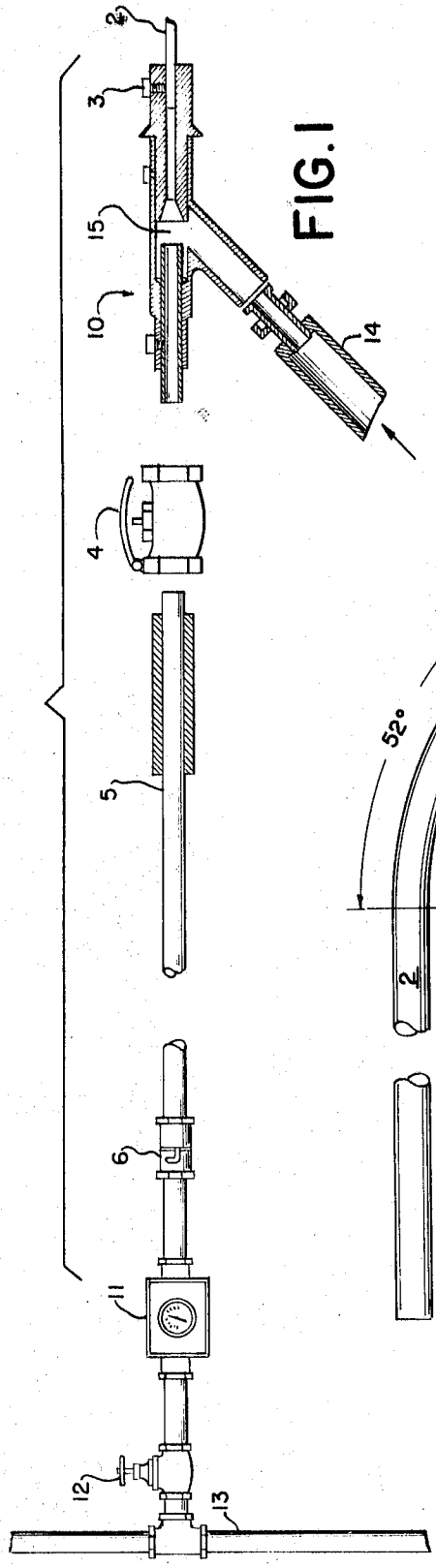


FIG. 1

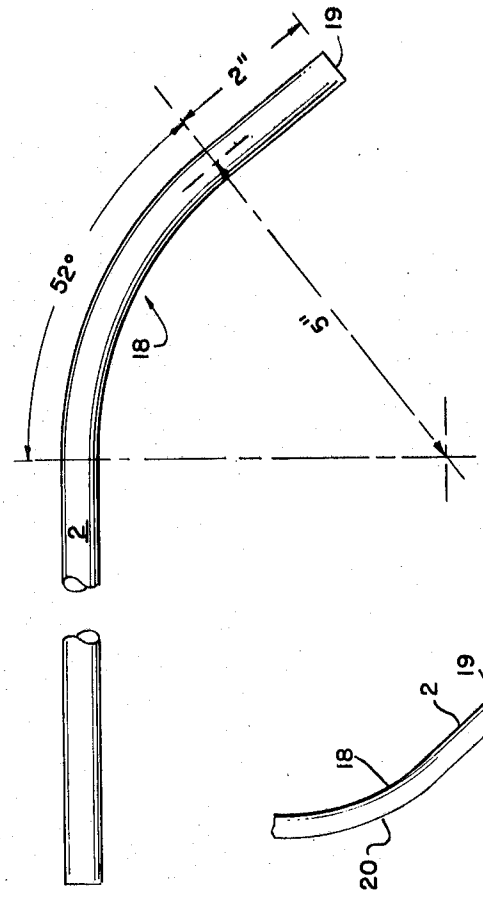


FIG. 2

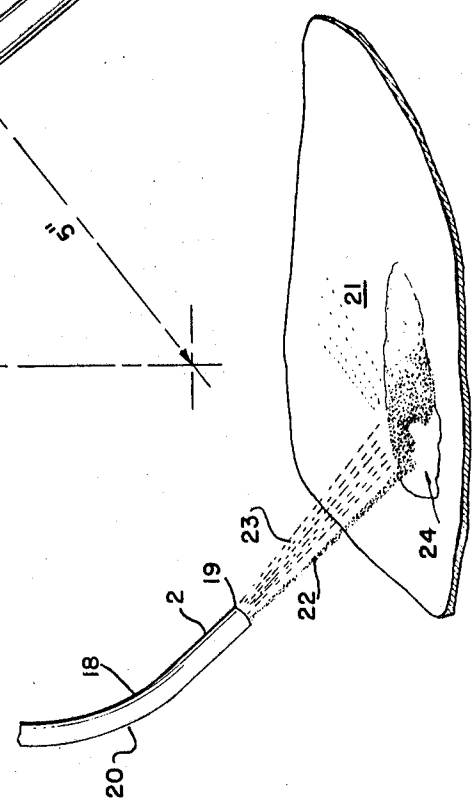


FIG. 3

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AIR PRESSURE GUN

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ABSTRACT OF THE DISCLOSURE

This invention relates to an air pressure gun for use in cleaning, for example, insulated generator windings with soft abrasive. The invention resides in the use of a curved nozzle whereby a layer of abrasive particles separate from the carrier air stream and impinge upon the surface to be cleaned with a wiping action rather than a conventional splattering which is inefficient and might injure the wiring or object being cleaned.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates specifically to a system for cleaning surfaces with pressure driven soft abrasive. The system disclosed is designed to use the abrasive to wipe or absorb grease or oils from a surface rather than remove a layer thereof as often results through the use of conventional sandblasting techniques.

(2) Description of the prior art

It is known in the art to use soft abrasive in air driven cleaning operations and to use a nozzle for directing the flow from a controlled pressure source, as for example, in U.S. Pats. 2,399,385 to J. W. Rasmussen and 2,428,276 to H. L. Griswold. However, these devices are designed to mix the abrasive discharge in a turbulent dispersion which splatters upon impact with the surface to be cleaned.

SUMMARY OF THE INVENTION

It has been discovered that a smooth curve in the nozzle of a conventional air pressure gun combined with a regulated pressure will cause the particles of abrasive to be discharged in a concentrated stream or layer. If this concentrated stream is directed at a surface to be cleaned at an angle of from 30 to 70 degrees a wiping action will result in which the stream of particles, separated from the carrier air stream strikes the surface and is directed along the surface by the air stream as contrasted to the normal splatter when the particles and carrier are mixed.

Accordingly, it is an object of this invention to provide an air gun nozzle to efficiently clean electrical parts without damaging insulation.

It is another object to propel soft abrasive in a concentrated stream for a wiping action across a surface to be cleaned.

It is a further object to provide a curved nozzle for blast cleaning electrical windings which will dispense a concentrated stream of soft abrasive in an angular direction at the surface of the windings to wipe grease and oil from the windings.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects will become readily apparent with reference to the drawings and following description wherein:

FIG. 1 shows a partial sectional view of the air gun of this invention.

FIG. 2 shows the nozzle in detail.

FIG. 3 shows the nozzle in operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The process of soft abrasive cleaning uses organic material such as ground corncobs, walnut shells, or industrial flour to remove films of dirt, oil, or grease from a harder surface without damaging the surface. Operation of conventional sandblasting equipment is not satisfactory because the light weight organic grit tends to scatter when it jets from the nozzle.

The system shown in FIG. 1 used with the nozzle, **2**, of this invention is largely of conventional design. Air under pressure is admitted to the gun, **10**, through an adjustable pressure regulator, **11**, and shut-off valve, **12**, from air line, **13**. Vacuum hose, **14**, connects venturi chamber, **15**, with a source of soft abrasive grits.

During start up the air pressure is adjusted at the regulator, **11**, until the desired concentration and layered flow of grits in the nozzle jet is reached. At increased pressure, flow from chamber, **15**, through nozzle, **2**, tends to be more turbulent.

The grit stream cleans most effectively when directed at the surface being cleaned at an angle of between 30 and 70 degrees. From 70 to 95 pounds per square inch (p.s.i.) air pressure is required to remove hard crusted dirt while from 30 to 40 p.s.i. is more effective for removing liquid oil deposits. The higher pressures will not damage wire insulation providing the nozzle, **2**, is held 4 to 6 inches from the surface, and kept in constant motion.

This method removes all dirt, oil, and loose paint and varnish in most cases, and any corona-damaged insulation.

The nozzle, **2**, may be ½ inch outside diameter copper tubing. The preferred configuration has a 52° arc on a 5 inch radius with its point of tangency 2 inches from the end of the nozzle. With this nozzle and the air pressure previously described 16 and 20 mesh corncob grits were highly effective. It should be noted that the use of a low angle of incidence between the abrasive stream to the work surface also facilitates the desired wiping action.

The wiping action illustrated in FIG. 3 results when the stream is separated from the air carrier. As the mixture from chamber, **15**, passes through nozzle, **2**, a centrifugal force is created by the curvature of the nozzle. It will be obvious to one of ordinary skill in the art that the type of curve may be varied, however, it must be a smooth curve. The grit passing around the curve, **18**, concentrates for tangential discharge at end, **19**.

In actual practice the nozzle is held with the outside, **20**, of the curved toward the work surface, **21**. The abrasive stream, **22**, then exits end, **19**, between the work surface, **21**, and the air stream, **23**, and stream, **23**, causes the grits to cluster on the surface, **21**, in front of a cleared area, **24**, rather than splatter. The angle of incidence of stream, **22**, onto surface, **21**, is determined by the tolerance of the surface for cleaning and the type of dirt covering the surface.

The elimination of splattering results directly when rebounding of the abrasive stream, **22**, as it strikes the work surface, **21**, is suppressed by the air stream, **23**. The wiping action desired is caused when the particles skid along the surface, **21**, rather than merely striking and rebounding as would be the case where the streams, **22**, and, **23**, exit the conventional nozzle in turbulent diffusion.

Nozzle, **2**, is releasably coupled to the gun, **10**, by a set screw, **3**. Hand valve, **4**, connects the gun, **10**, to hose, **5**, which is in turn connected to air line, **13**, by a re-

leasable coupling, 6. The nozzle connection and type of gun may be varied within the scope of this invention.

I claim:

1. An air pressure gun system for dispensing pressure driven soft abrasive grits onto a work surface comprising:

(a) a source of air under pressure;

(b) a source of grits;

(c) a venturi mixing chamber for drawing said grits into a stream of air from said pressure source, said chamber having an entrance port for air, an entrance port for grits, and an exit port for the mixture;

(d) nozzle means connected to said exit port of said chamber comprising a tube having a central passage of uniform diameter, said tube having an entrance end, a first straight portion adjacent said entrance end, an exit end, a second straight portion adjacent said exit end, and a curved portion intermediate said first and second straight portions, the curve of said tube describing an arc of a circle; and

(e) air pressure regulating means connected to said nozzle means for adjusting the air pressure to a pressure level at which said grits and said air stream separate into a layered flow of adjacent streams of air and air driven grits inside said nozzle, said grit stream being adjacent the outermost acruate wall inside said nozzle and said stream of air being adjacent the innermost arcuate wall inside said nozzle, whereby a layered flow of adjacent streams of air and air driven grits emanates from said nozzle exit, said grit stream emanating from the outermost arcuate wall of said nozzle and said stream of air emanating from the innermost arcuate wall of said nozzle.

2. A method of cleaning a work surface with pressure driven soft abrasive grits comprising:

(a) providing mixing chambers means for mixing soft abrasive grits with a stream of pressurized air;

(b) providing a source of grits and a source of pressurized air connected to said mixing chamber;

(c) passing said mixture through a curved nozzle connected to said mixing chamber and configured to separate said mixture into adjacent streams of air and air driven grits;

(d) controlling said pressurized air to maintain separate adjacent streams of air and air driven grits within said curved nozzle and at the exit thereof; and

(e) directing said curved nozzle with the curve thereof arcing downwardly so that said streams of air and air driven grits are directed onto a work surface at an angle thereto so that said air stream holds said grit stream onto said surface and said grits skid along said work surface absorbing and removing foreign material from the work surface in pelletized form.

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OTHELL M. SIMPSON, Primary Examiner

U.S. Cl. X.R.

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