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AIR COMPRESSING AND HEATING APPARATUS

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Fig. 1.

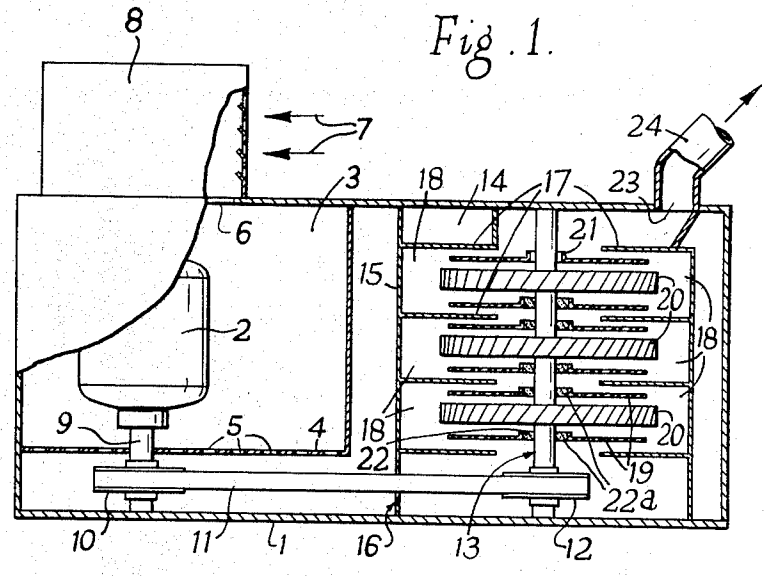
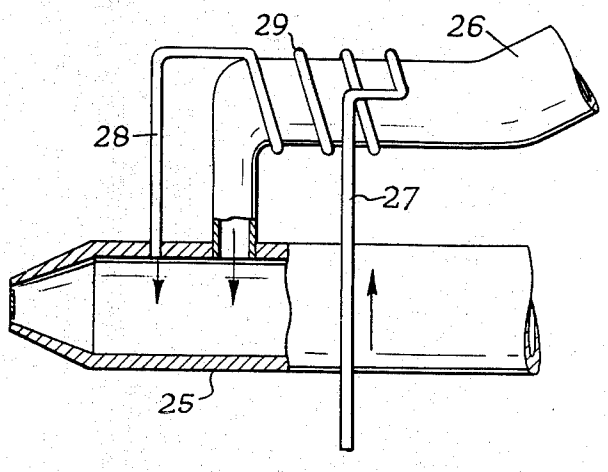


Fig. 2.



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AIR COMPRESSING AND HEATING APPARATUS

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1 Claim. (Cl. 126—247)

This is a continuation-in-part of my co-pending United States Patent Application No. 97,833 filed March 23, 1961, now abandoned.

The spraying of certain suitable paints such as cellulose lacquers can be carried out by use of a stream of compressed air which is caused to break up the paint into finely-divided droplets and to carry said droplets, as a spray, onto the surface to be covered. Where a relatively high air pressure is used, a proportion of the droplets separate from the main stream creating the "fog" is well known to users of spray guns. Moreover, the drops which reach the surface to be coated burst as a result of the force with which they are projected thereon. This results in a second formation of fog, and the covering power of the coating is considerably reduced.

These drawbacks have to some extent been eliminated by the use of relatively slower moving lower pressure air streams which convey the drops of paint without fogging to the surface, where it spreads itself again without the impact causing fogging. Whilst this has the advantage that no fogging occurs, and the covering power is thereby increased, it is only relatively thin and diluted paints or coatings which can be used. The requisite thinning detracts from the quality of certain paints, while others are thereby rendered unusable altogether.

This disadvantage can be overcome to a certain extent by heating the paint to lower its viscosity, and it has already been proposed to provide electrical heating elements in paint spray guns for this purpose.

The object of the present invention is to provide a source of compressed air, for use in conjunction with low-pressure spray guns, in which heating of the air stream is obtained automatically at the same time as the air is compressed. It is known that the act of compressing air will always result in a rise in temperature, but with the apparatus of the present invention a still further increase of temperature is obtained, for imparting to the paint, to render it free flowing and less viscous.

In the accompanying drawing:

FIG. 1 is a central vertical section through a compressor.

FIG. 2 is an elevation, partly in section, of a representative spray gun which could be used with the compressor.

The compressor shown in FIG. 1 consists of an air-tight casing **1** containing an electric motor **2** situated in an intake compartment **3**. The bottom wall **4** of the intake compartment is apertured at **5**. The top wall of the casing **1** is apertured at **6**. The arrows **7** indicate the path of atmospheric air into a filter cover **8**. The motor **2** has a spindle **9** with a pulley **10** driving a belt **11** passed about a pulley **12** secured on a shaft **13** journalled in a second compartment **14** defined by a wall **15** apertured at **16**.

The compartment **14** contains a number of internal walls **17** which define three chambers **18, 18, 18**. Within each chamber **18** is disposed a pair of apertured baffles **19, 19** which are spaced from each other and from the walls **17**.

Three turbine impeller rotors **20** with suitably inclined blades are secured on the driven shaft **13** and are rotated by the motor at a suitable high speed.

Each rotor **20** is positioned in spaced relationship between one of the pairs of baffles **19, 19**.

On the uppermost baffle **19** there is provided a relatively narrow collar **21** narrowly spaced from the shaft **13**, and on each of the other baffles **19** there is provided a relatively wider collar **22** more widely spaced from the shaft **13**, each wider collar **22** receiving a packing gland **22*a*** disposed about the shaft **23** in air-tight sealing engagement therewith.

The top wall of the casing **1** is apertured at **23** leading to a conduit **24** for passage outwardly of a stream of compressed air.

Referring now to FIG. 2, there is shown schematically a representative spray gun which comprises a nozzle **25**, a first conduit **26** for leading in compressed air, and a second conduit **27** for leading in liquid paint. By the well-known Venturi effect, the passage of an airstream through and out of the nozzle **25** causes a lowering of pressure at the lower end of the portion **28** of the paint conduit, thereby sucking paint through the conduit **27**. The conduit **27** is formed as a coil **29** about the air conduit **26** and forms therewith a simple heat-exchanger. If heated air is supplied to the conduit **26**, for example by connecting it to the outlet conduit **24** of the compressor of FIG. 1, the heating of the conduit **26** will be transferred to the paint passing through coil **29**.

As a further refinement, a portion of the air supplied through conduit **26** may be branched off and led into the usual paint container, thereby to force the paint up the conduit **27**.

Referring now again to FIG. 1, when the motor **2** is operated, the turbine rotor is driven to produce a compression at the upper part of the compartment **14**, because the turbine rotors impel the air upwards, and a reduction of pressure at the lower part thereof. Fresh atmospheric air is accordingly drawn in (see arrows **7**), passes through the filter cover **8**, past the motor (to cool it), through the apertures **5** and **16**, and into the lowermost chamber **18**.

The three assemblies of turbine rotor and associated pairs of baffles in a chamber **18** each constitute a separate stage of compression and heating of the air drawn in. The first stage (lowermost) receives the cold incoming air, the second (middle) stage receives partly-warmed air and heats it further and passes it to the third (uppermost) stage, the latter giving both further compression and heating and also serving to a certain extent as a means for accumulating, releasing and smoothing out the flow of heated compressed air. There is no expansion of the air stream upon entering the conduit **24** from the compressor, and accordingly the air retains its temperature until it reaches the passage **26** and coil **29** of the spray gun.

Whereas it is conventional to use pressures of the order of one to two kilogrammes per square centimetre, the apparatus of the present invention needs only to compress the air to a pressure of the order of two to three hundred grammes per square centimetre, whilst obtaining a greater rise in temperature, due to the presence of the baffles **19**, than would be obtained by simple compression to the same extent.

The driving and beating of the air by each rotor **20** against and through its associated baffles causes a high degree of energy, derived from rotation of the rotor, to be transferred to the air by enforced turbulence, whilst at the same time the air is moved generally upwards and compressed so as to flow out at conduit **24**. Layers of compressed air are formed in each of the three stages of the compressor.

The space in each chamber **18** radially beyond the turbine rotor **20** serves as a zone of accumulation, whilst the space in each chamber **18** defined between each rotor and its associated baffles, and also between those baffles and the adjacent walls **17**, serve as zones of compression and heating by turbulence.

I claim:

Apparatus for supplying compressed and heated air comprising:

(a) a casing having outer walls, including a first air inlet and an air outlet and containing a motor and a separate inside compartment;

(b) said compartment within said casing containing a rotatable air compressing and heating means, said compartment further comprising (1) compartment enclosing walls having a second air inlet in communication with the interior of said casing, and said air outlet to the exterior of said casing; and (2) a series of opposed inner divider walls connected to and projecting inwardly from said enclosing walls, said divider walls being parallel to and spaced from each other where they connect to said compartment enclosing walls and said divider walls defining a series of air chambers connected by a common passage transverse to said divider walls and connecting said second air inlet and said air outlet;

(c) said motor within said casing situated between said first air inlet and said second air inlet to said compartment whereby air passing into and through said first air inlet surrounds and cools said motor and thereafter passes in heated condition through the common passage of said compartment and out of said air outlet; and

(d) said air compressing and heating means comprising a rotatable shaft disposed in said common transverse passage and drivingly connected to said motor, said shaft having mounted thereon in each air chamber at least one rotatable air impeller blade and at least one apertured baffle, said baffles mounted on said shaft being interleaved with said inner chamber walls in staggered relation to said walls to create a tortuous path for turbulent air driven through said passage by said blades.

References Cited by the Examiner

UNITED STATES PATENTS

1,598,289	8/1926	Lee	126—247 X
1,682,102	8/1928	Allen	126—247
2,460,861	2/1949	Walters	239—132
2,613,995	10/1952	Reinhold	239—351
2,683,448	7/1954	Smith	126—247
3,075,514	1/1963	Paugh	126—247

FOREIGN PATENTS

957,200	8/1949	France.

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