COMPRESSED AIR CLEANING SYSTEM FOR TURBINE POWERED DENTAL EQUIPMENT

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Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.
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COMPRESSED AIR CLEANING SYSTEM FOR TURBINE POWERED DENTAL EQUIPMENT
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5 Claims

ABSTRACT OF THE DISCLOSURE

A compressed air cleaning system. More particularly, the invention includes a system for providing compressed clean air and wherein compressed air is directed through a cyclonic device. The compressed air is desirably of such extreme requirements for compactness, the ori­

CROSS-REFERENCE

This application is not related to any pending United States or foreign application.

SUMMARY OF THE INVENTION

Many applications require compressed air which must be substantially free of contaminants. This invention will be described as it is particularly applicable for providing compressed air for turbine powered dental equipment. The invention is concerned with means of cleaning the compressor air with respect to the relationship of the cyclonic and purification elements of the invention. The heart of the system of this invention is the cyclonic unit 16 better shown in enlarged cross-sectional view in FIGURE 2. Basically the cyclonic unit 16 includes a cylindrical portion 28 having inlet 30 and outlet 32 and an interior surface 28A. The inlet conduit 26 connects to the cylindrical portion 28 through the vortex opening 34. Below the conical portion 28 is a conical portion 32, having a conical interior surface 32A, the large diameter end of which coincides with the lower end of the cylindrical surface 28A. The conical portion interior surface 32A tapers to a reduced diameter vortex opening 34. Below the conical portion 32 is a subconical portion 36 communicating with conical portion 32 through the vortex opening 34. The subconical portion has an interior surface 36A which expands outwardly and downwardly in enlarged diameter communicating with an underflow pot 38. Above communicating with the underflow pot is a final clean air outlet conduit 22 extending through the object of this invention to provide a means of accomplishing the objective.

DESCRIPTION OF THE VIEWS

FIGURE 1 is a diagrammatic view showing the essential elements of the invention as utilized to provide clean compressed air for a turbine powered dental drill. FIGURE 2 is an enlarged cross-sectional view of the cyclonic element of the invention. FIGURE 3 is a fragmentary view of the basic arrangement of FIGURE 1 showing alternate arrangement of the relationship of the cyclonic and purification elements of the invention. FIGURE 4 is an additional alternate arrangement of the basic components of FIGURE 1 showing two cyclonic units having the purification element therebetween. FIGURE 5 is a cross-sectional view taken along the line 5—5 of FIGURE 2 showing the arrangement of the grid element in the underflow pot of the cyclonic element.

DETAILED DESCRIPTION

Referring first to FIGURE 1 the basic arrangement of the invention is shown. The system includes essentially an air compressor 10 driven by a motor 12, providing the compressed air through conduit 14 to the cyclonic unit 16. The cyclonic unit 16 receives the compressed air from conduit 14, the cyclonic unit having a clean air outlet conduit 18 and a contaminant outlet conduit 20. The clean air outlet conduit 18 feeds into a purification element 22 having a final clean air outlet conduit 24. Clean air is provided at the final outlet conduit 24 for an application requiring clean, compressed air, such as to feed a turbine powered dental drill 26.

It is understood that of the elements making up the basic arrangement described to this point the air compressor 10, motor 12, and the turbine powered dental drill 26 form no part of the actual invention but instead the invention is concerned with means of cleaning the compressed air provided in conduit 14 and delivering it to final outlet conduit 24 substantially free of entrained contaminants.

The heart of the system of this invention is the cyclonic unit 16 better shown in enlarged cross-sectional view in FIGURE 2. Basically the cyclonic unit 16 includes a cylindrical portion 28 having inlet 30 and outlet 32 and an interior surface 28A. The inlet conduit 26 connects to the cylindrical portion 28 through the vortex opening 34. Below the conical portion 28 is a conical portion 32, having a conical interior surface 32A, the large diameter end of which coincides with the lower end of the cylindrical surface 28A. The conical portion interior surface 32A tapers to a reduced diameter vortex opening 34. Below the conical portion 32 is a subconical portion 36 communicating with conical portion 32 through the vortex opening 34. The subconical portion has an interior surface 36A which expands outwardly and downwardly in enlarged diameter communicating with an underflow pot 38. Above communicating with the underflow pot is a final clean air outlet conduit 22 extending through the object of this invention to provide a means of accomplishing the objective.

Turbine powered dental drill 26 generally consists of a small turbine wheel 26A supported between upper bearings 26B and lower bearings 26C. Compressed air flowing into the turbine drill 26 impinges upon the exterior surface of the turbine wheel 26A causing it to rotate. The turbine wheel includes an opening 26D receiving a dental drill 26E. Since the entire turbine powered dental drill
26 must be placed into the mouth of the patient by the dentist the air which passes outwardly through exhaust vents 26F in the unit passes into the mouth of the patient and for hygienic purposes must be clean of entrained contaminants including dust particles, bacteria and so forth.

The purification element 22 consists of replaceable or reactivatable type agents for adsorbing or absorbing liquid vapor, airborne corrosive chemicals and the like, such replaceable or reactivatable type agents include materials such as atapulgite clay, activated charcoal, silica gel, calcium chloride, etc.

In the arrangement of FIGURE 1 the purification element 22 is placed subsequent the cyclonic unit 16, that is between the cyclonic unit and the final clean air outlet conduit 24. This arrangement may be reversed as shown in FIGURE 3 in which the purification unit is placed in advance of the cyclonic unit.

An alternate arrangement of the invention is shown in FIGURE 4 including a first cyclonic separator unit 16A and a second cyclonic unit separator 16B in series having purification element 22 therebetween. The arrangement of FIGURE 4 provides ultimate cleaning in that the cyclonic unit 16A installed ahead of the purification system 22 provides first stage separation for solid contaminants entrained in the air. This upstream separator 16A relieves the purification system from rapid deterioration in cases of extreme contaminant entrainment in the compressed air supply. The second cyclonic unit 16B is used for obtaining very clean air for purposes such as to drive the turbine powered dental drill 26 as shown in FIGURE 1. The first cyclonic unit 16B affords protection against entrainment of sloughed chemicals which may migrate from the purification unit 22.

Thus the invention provides a new and unique arrangement for providing a clean air supply for medical and other purposes. The cyclonic unit 16 is capable of separating from the air stream entrained submicron particles contaminants and bacteria while the purification element 22 extracts non-solid components such as water vapor, chemical vapors and the like.

What is claimed:

1. A compressed air system for a turbine powered dental drill comprising:
   a turbine powered dental drill having an air inlet;
   an air compressor having an air outlet;
   a cyclonic separator unit having an upper cylindrical portion including a top wall having an axial opening therein;
   an air inlet tangentially intersecting the interior cylindrical surface of said cylindrical portion, said air inlet being connected to said compressor air outlet;
   a frusto-conical portion coaxial with said cylindrical portion having the larger internal diameter end coincident with the internal diameter of said cylindrical portion, the interior of the frusto-conical portion tapering to a reduced diameter vortical opening at the lower end thereof;
   a subfrusto-conical portion coaxial with said frusto-conical portion and said cylindrical portion, said subfrusto-conical portion having an internal frusto-conical surface defining an upper reduced diameter vortical opening coincident with said vortical opening at the lower end of said frusto-conical portion and tapering to an enlarged diameter lower opening;
   an underflow pot having an enlarged interior volume communicating with said lower opening of said subfrusto-conical portion and providing a quiescent settling zone;
   a closable contaminant outlet in the lower end of said underflow pot;
   a vortex finder extending from said top wall and coaxially within the top portion of said cylindrical portion and including an axial opening therethrough communicating with said opening in said top wall and providing a clean air outlet connected to said turbine powered dental drill air inlet; and
   an air purification element in series with said cyclonic separator air inlet.

2. A compressed air system for a turbine powered dental drill according to claim 1 wherein said air purification element is of the adsorptive type.

3. A compressed air system for a turbine powered dental drill according to claim 1 wherein said air purification element is of the absorbative type.

4. A compressed air system for a turbine powered dental drill according to claim 1 wherein said air purification element is in series with said clean air outlet of said cyclonic separator, said air purification element being capable of removing said solid contaminants from said compressed air and including a replaceable or reactivatable type air purification element having a clean air outlet and a second cyclonic separator having an air inlet and a clean air outlet, said clean air outlet of said air purification element being connected to said clean air outlet of said second cyclonic separator air inlet; and
   a second cyclonic separator having an air inlet and a clean air outlet, said clean air outlet of said air purification element being connected to said second cyclonic separator air inlet, said second cyclonic separator clean air outlet being connectable to a turbine powered dental drill.

5. A compressed air system for a turbine powered dental drill according to claim 1 wherein said air purification element is in series with said cyclonic separator air inlet.

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