

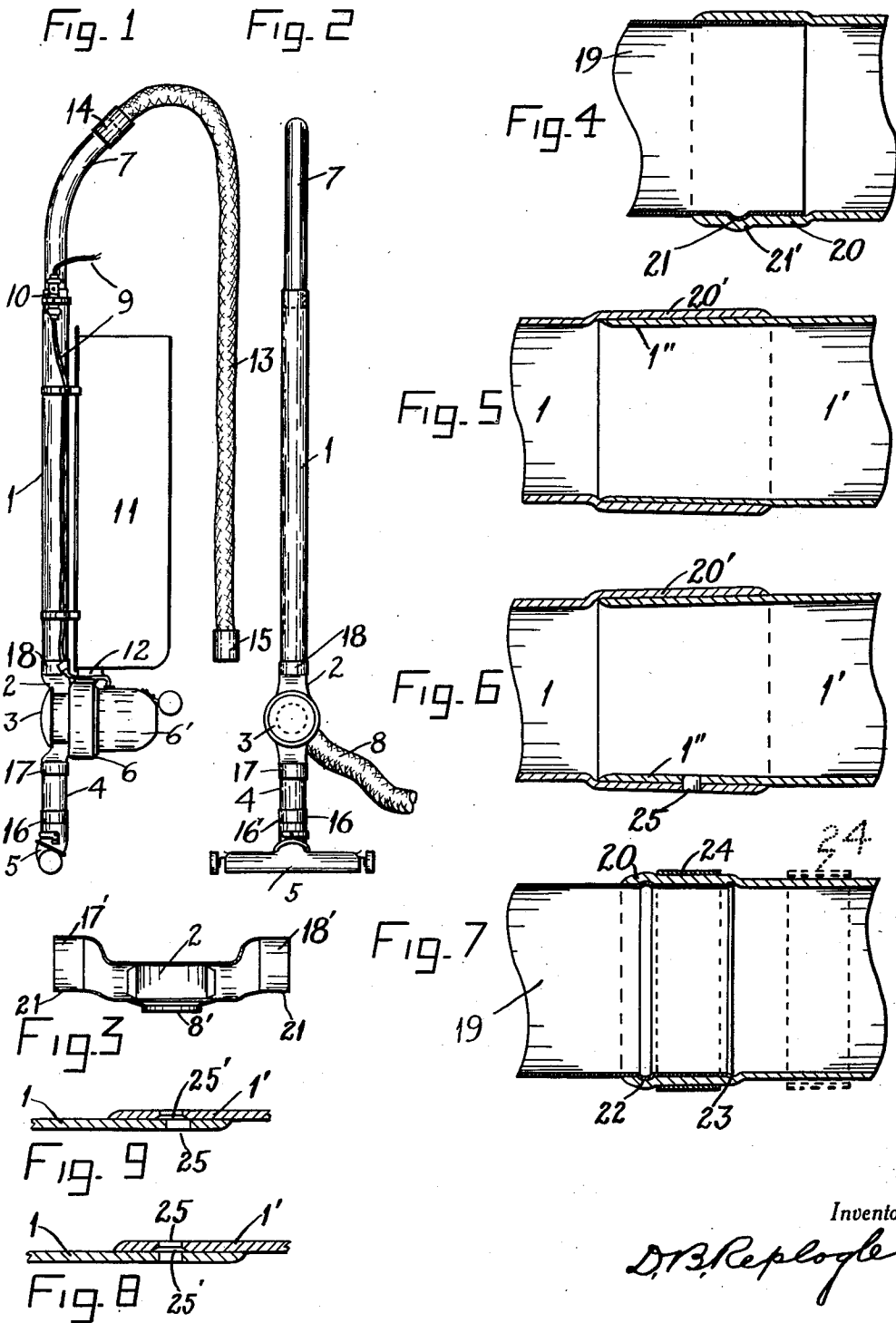
Jan. 3, 1939.

D. B. REPLOGLE

2,142,149

TUBULAR ELEMENT OF AIR-METHOD CLEANING SYSTEMS

Original Filed Jan. 12, 1932



Inventor

D. B. Replogle

UNITED STATES PATENT OFFICE

2,142,149

TUBULAR ELEMENT OF AIR-METHOD CLEANING SYSTEMS

Daniel Benson Replogle, Berkeley, Calif., assignor
to The Ohio Citizens Trust Company, Toledo,
Ohio, a corporation of Ohio, as trustee

Application January 12, 1932, Serial No. 586,192
Renewed December 22, 1936

1 Claim. (Cl. 285—161)

This invention relates to "Air-way" cleaning systems, such as is shown in my U. S. Patent No. 1,533,271, of April 14, 1925, and particularly to that part of such systems, which constitutes the tubular or pneumatic handle elements of the individual or portable sweeper, and such as is more particularly shown in my patent for Pneumatic cleaner No. 1,345,550, patented July 6, 1920 and reissued as No. 16,224 December 15, 1925. Cleaners of this type are known commercially under the registered trade-mark "Air-way".

One of the first requisites of such tubular parts is that they should be of extremely strong or tough material so light in weight that the greatest carrying capacity can be had with the least possible bulk; another is that the parts should be non-conductors of electricity; and still another, that they should be nonabrasive so as not to mar furniture when struck with the same, and they should be agreeable to the hands of the user.

Such tubular parts have heretofore entered into the construction of such suction or "Air-way" cleaning apparatus, but generally where the same have been attached to the necessary metallic parts, they have been inserted into clamps or heavy parts with bolts or screws to secure the tubular fiber to the metallic parts.

The objects of the present invention are therefore to simplify practice or to provide simple and effective means for joining fiber tubes to relatively thin metallic tubes of such "Air-way" apparatus so as to maintain the lightness required; to provide such construction that the inner surfaces or passageway of the tubes may be kept continuous with uniform diameter and carrying capacity where they are attached to such metallic parts; to provide adaptable joints of such a fiber tube where fiber is permanently joined to fiber; and to make a complete and continuous handle or tubular conduit with separable joints, as well as permanent joints of fiber to fiber; to maintain electrical non-conductivity in such tubes or handles, and other objects as may herein appear and be pointed out in the claims.

These objects are attained by the use of the material, construction and methods of construction as set forth herein, or the equivalent of the same. The word fiber as used in this specification refers to what is commercially known as vulcanized fiber; but must be of a good strong quality, such as is made into tubes by winding rag paper on mandrels, treating with chlorides, and

rolling to a suitable hardness. Any other product having sufficient strength, hygrometric quality of expansion and contraction, and dielectric qualities may be substituted.

The construction and methods of construction are set forth herein, and explained and illustrated in the accompanying drawing in which:

Fig. 1 shows a portable electrically operable cleaner in the assembly of which my invention is employed.

Fig. 2 shows the handle portion at right angles to the view in Fig. 1, with the electric motor removed and a hose-pipe adapted to lead from remote suction producing means, connected in place of the motor and fan of the portable device.

Fig. 3 shows a segregated side elevation of the metallic valve member to which air conduit tubes, according to my invention, are joinable.

Fig. 4 is a view in longitudinal section, illustrative of the arrangement where a metallic pipe or nipple of the valve member is permanently joined to a fiber tube, according to my invention.

Fig. 5 is a view in similar section illustrative of the slip joint where fiber tube joins fiber tube.

Fig. 6 is a view similar to Fig. 5 wherein a permanent joint is formed by a fiber or plastic rivet.

Fig. 7 is a view showing a modified form of the joint shown in Fig. 4.

Fig. 8 illustrates a modification of the riveting shown in Fig. 6.

Fig. 9 further illustrates a modification of the riveting shown in Fig. 8.

Similar characters of reference denote like and corresponding parts in the several views.

Referring to the drawing, 1 denotes the longer or handle tube of an "Air-way" cleaner, which is joined to a valve member 2; and 4 denotes the shorter or floor connecting tube of the same device, both of which tubes are joined to the valve member 2, according to the construction and method of my invention.

Within the valve member 2 is the transparent-topped valve 3, designed to interchangeably direct air currents from the several sections of tube as suction is set up by the motor means 6; so that suction may proceed from the floor tool 5, or from the outer curved handle end 7, according as the valve 3 is turned. When remote suction producing means, not shown, is used, a flexible conduction hose-pipe 8 is substituted and attached to the valve member 2 in place of the motor means 6; and serves to carry away the

dust-laden air, in operation; whereas, when the motor means 6 is used, an electric conductor 9, controlled by a switch 10, is attached to the longer or handle tube 1; and connected, to operate the motor means 6. In the latter case, the dust-laden air is directed into the dust collector 11, attached at the exhaust 12 of the motor means.

For the purpose of illustrating the versatility of the device, an applicatory hose 13, is attached to the handle at 14; and is intended to have applicator devices connected to its end 15, for such service as is not the usual sweeping or floor cleaning.

With the purposes of these devices now clearly set forth, the nature of my present invention, and its applications, may be readily comprehended.

I have found that where a fiber tube of a diameter suitable for handles of such devices, has walls of a thickness approximately one-thirtieth part of its circular diameter, it will provide an adequate air flow at pressures such as can be produced by one or more limited weight electrical motor driven fans; and the coefficient of circular expansion produced by soaking such a tube in water, is sufficient to permit it to be fitted over the end of a rigid tube or mandrel about one-thirtieth greater in diameter than the inside of the tube before it was soaked; and that thereby a secure and dependable joining is effected, by contraction of the fiber tube end, placed thereon.

I have also found that where a previously expanded and dried tube end is removed, even though with difficulty, it remains in practically the same enlarged condition, due to an apparent molecular adjustment or limited plasticity; but nevertheless if soaked again as before, it is subject to considerable additional enlargement but still retains its contractile qualities.

Therefore the present invention utilizes the discovery just mentioned in the constructions as shown in the drawing.

In Figs. 4 and 7 is shown, in full size, the details of construction of joints similar to those shown at 16, 17 and 18, in Figs. 1 and 2, the metal shank 19 in said figures corresponding to any one of the shanks 16' of the floor tool 5, or 17' and 18' of the valve member 2. The thickness of the wall of the metal shank is about one half of the total enlargement of the fiber end 20, in this construction, so that the inner concave surfaces of the metal tube 19, and the fiber tube 20 are flush.

Although the contraction of the fiber tube end, on smooth metal may be quite sufficient ordinarily, to hold firmly enough; it is sometimes desirable where a relatively permanent connection is required that the exterior or convex surface of the metal tube be roughened by some means, to give security against slipping off, or rotating. Sharp projections on the metal surface are however objectionable; since they may cause mutilation and weakening of the softened fiber, when being slipped to position.

In the construction of fiber to metal joint I therefore prefer to have an embossment or rimple 21, pressed into the metal, over which the fiber end 20 may conform in contracting, as at 21'. Or as a substitute, beads 22 and 23 may be used as shown in Fig. 7. And as a further security, after the parts have been connected and the fiber has been allowed to dry, a metallic ring 24, may be contracted over the joint, as is further shown in Fig. 7. A method of securing the ring 24 is to heat it with a suitable flame while in the position

shown in dotted lines, until sufficiently expanded by heat; then to slip to the position shown in solid lines, where it contracts as it cools.

Where fiber tube is to be joined to fiber tube, as shown in Figs. 5 and 6; the enlarged end of tube 1, is prepared, as previously suggested, by successive applications of soaking and stretching until it shall fit over the end of a similar or nearly similar tube 1', or the end of the tube 1' may be contracted in part, by pressing the same into a hot iron bored with a tapering cavity suitable for reducing the same; since heating increases the plasticity, so that proper tapering and reduction is readily attained in that way; and because of its driving out moisture, a tendency to subsequent slight enlargement occurs, which assists fitting.

Permanency of fiber to fiber joints may be effected by boring through both walls as shown at 25, and driving into said bore an expansible rivet, such as dried fiber, which may be cut close and polished down to a surface with the outside of the tube 1. The rivet, from which the normal moisture content has been driven, soon absorbs moisture from the atmosphere and expands, providing the fluid-tight fit. Or as a substitute for such bore as shown at 25, that part of the bore extending through the wall of tube 1', may be counter-bored as shown at 25' in Figs. 8 and 9. This counter-boring is effected by taking the ends apart, after first boring as shown in Fig. 6. Instead of a fiber rivet however, the parts are now to be anchored into permanent relation with each other, by rubbing into the bore, a congealable plastic or liquid, particularly a thermoplastic setting compound of the phenol condensation type, such as is known under the trade name as Bakelite. If the holes are brought to match perfectly, as shown in Fig. 8, or only imperfectly, as shown in Fig. 9, the plastic will fill into the counter-bore 25', in either case forming an interior anchoring flange within the bore 25 as modified by the counter-bore 25'. The use of material which expands on setting and which does not require such a high degree of heat to apply as will burn or char the fiber, insures a fluid-tight connection which is an essential in connection with suction cleaning apparatus, to which the present invention primarily relates.

Where systematic mass production is to be obtained, it should be noted that the tube ends to be expanded, should be set into water, sufficiently deep, in numbers, as for example a day's quota, each day in advance of the day it is to be operated upon. Hot water, in place of cold, will reduce to a pliable softness and expansion, in much less time than cold water.

The fiber tube ends are softened and expanded until they can be pressed over the unexpanded ends with a hugging grip while still in a moist condition, after which the moist ends are allowed to dry and contract. If the unexpanded end is smooth, a fluid-tight but removable joint is obtained. If the unexpanded end is provided with irregularities, the expanded end contracts over the irregularities, conforming thereto in drying, and thus a relatively permanent joint is obtained. Where a relatively fixed joint composed of two fiber sections is desired, the sections may be secured together by use of rivets composed of material which expands on setting and which does not require a high degree of heat to apply. When a relatively fixed metal to fiber joint is required a metal ring may be shrunk over the fiber end, binding it to the metal end.

While the construction and method set forth, is particularly applicable to the tubes utilizable in "Air-way" cleaning systems, they are applicable to any analogous or similar purpose, and are
5 likewise capable of considerable variation without departing from the scope and spirit of this invention.

Having now set forth the invention and its manner of operation, what I claim and desire to
10 secure by Letters Patent is:

In an air-method cleaning system, a tubular conduit composed of a plurality of abutting tubular sections at least one of which is composed of fiber, the abutting sections being arranged to overlap one another at their ends with a fluid-tight gripping fit, bores extending through the walls of the overlapping portions, and non-metallic initially plastic rivets connecting said bores fluid tight. 5

DANIEL BENSON REPLOGLÉ. 10