

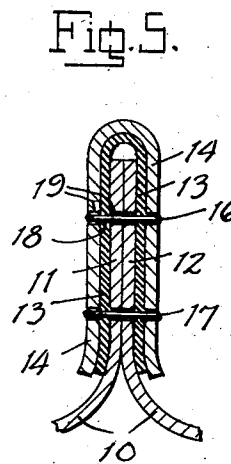
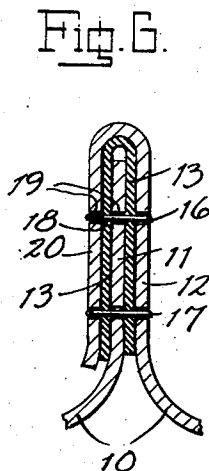
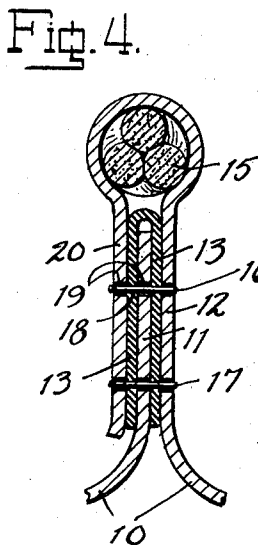
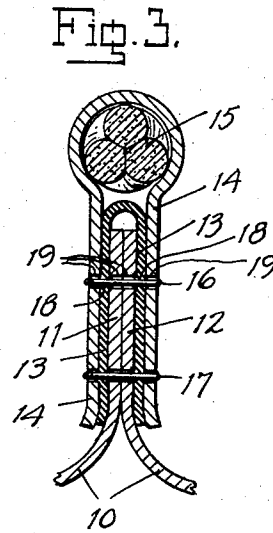
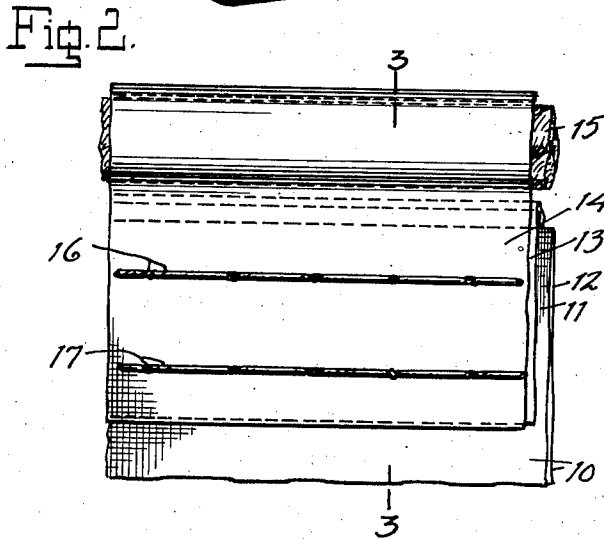
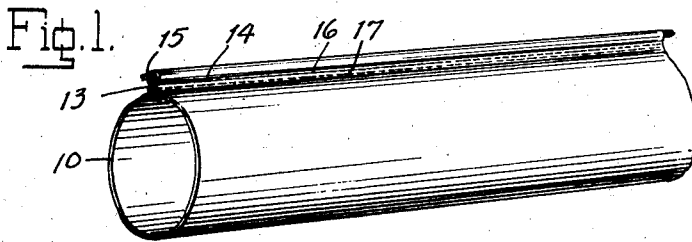
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SEAM STRUCTURE FOR FLEXIBLE VENTILATING TUBING

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SEAM STRUCTURE FOR FLEXIBLE
VENTILATING TUBING

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1 Claim. (Cl. 138—49)

The present invention relates to seam structure for flexible ventilating tubing such as is used in mines, tunnels, and the like, for carrying air into the tunnel headings, and various parts of mines, and has for an object to provide a tubing preferably formed of heavy woven fabric having a sawed seam which is effectually sealed against leakage under pressure and for relatively long distances, so that it can be used with all types of blowers, and particularly where it is preferable to use only one positive type of high pressure blower.

Where flexible tubing is used for delivering air at short distances and in connection with centrifugal or low pressure fans, leakage at the seam does not seriously impair the function of the tube. It has been impractical, however, with the type of sewed seam heretofore in use, to employ such tubing for long distances, say 3000 feet or more, where comparatively high pressures are used, and in cases where the run of tubing is as much as 5000 feet the leakage has been found to be extremely high. Obviously such performance overworks the fan and does not conduct a satisfactory amount of air to the delivering point.

Leakage at the seam is commonly due to sewing, as this is done with heavy strong thread, requiring a large diameter needle, and as this needle punches holes larger than the thread, the latter does not fill up the holes, with the result that there is a line of holes in the seam which permits air leakage, even under low pressures, and at relatively high pressures the leakage over any considerable distance is so great that the tubing becomes impractical. While attempts have been made to produce a leak-proof non-sewed seam by cementing, and also by coating the outside of the seam of the tubing with asphalt or similar material, these have not been satisfactory, as the methods have been costly and slow in production, usually requiring hand-application and hand-rolling. The substances used would also soften under high temperatures, producing a sticky, smeary surface which would come off on the hands when the tubing was handled.

It is an object of the present invention to produce a sewed seam in which the needle holes will be effectually sealed, and to this end I particularly propose to incorporate in a sewed seam a strip of pliable resilient material such as rubber treated or coated cloth, which is combined in the seam in such manner that it closes about the threads of the seam in tightly sealed relation and provides a plug seal for the ends of the needle

produced holes in the adjacent layers of the tubing material, so that while these holes in the tubing material do not themselves close in sealed relation around the threads the elastic strip of material which is capable of closing tightly about the threads does in effect close or plug the holes in the tubing material at the points where leakage may occur. The elastic strip interposed in the seam is also so arranged that during the stitching operation the seam may be compressed against the yieldability of the strip, so that an extremely tight stitching will result, and the layers of the tubing material and the strip will thus be held in tight surface conforming relation contiguous to the stitching.

With the above and other objects in view, embodiments of the invention are shown in the accompanying drawing, and these embodiments will be hereinafter more fully described with reference thereto, and the invention will be finally pointed out in the claim.

In the drawing:

Fig. 1 is a perspective view of a portion of flexible ventilating tubing, according to my invention.

Fig. 2 is an enlarged side elevation of a portion of a short length of the seam portion of the tubing.

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a sectional view of a modified form of the invention.

Fig. 5 is a sectional view of a modified form of the invention, wherein the rope as shown in Fig. 3, is dispensed with.

Fig. 6 is a sectional view of another modification of the invention, wherein the rope as shown in Fig. 4, is dispensed with.

Similar reference characters indicate corresponding parts throughout the several figures of the drawing.

Referring to the drawing and particularly to Figs. 1 to 3 thereof, the tubing material 10, which is preferably a heavy woven fabric as duck, drill, canvas, or the like, preferably treated, impregnated, or coated to render it waterproof, air tight, fungus resisting, and otherwise suitable for use in mines, is brought together along its longitudinal edge portions 11 and 12 to form a longitudinal fin along the tubing, and has engaged over these portions an inverted U-shape sealing strip 13 of pliable and resilient material, the sides of this strip extending over the sides of the portions 10 and 11 and the right enclosing the outer edges,

Another inverted U-shaped strip 14, preferably made from the same woven fabric as the tubing, is engaged over the sealing strip and encloses a rope member 15 which provides a longitudinal rib or enlargement adapted to have suspension clamps secured about it at suitable intervals in the usual manner. The seam is secured by two rows of machine stitching 16 and 17 extending through the six parallel layers produced by the several parts of the seam.

The material of the ventilating tubing as above pointed out is a heavy woven fabric, and is treated with substances which render it relatively stiff, and from its nature the punch holes formed therein by the sewing needles do not contract after they are once made by the needle, and as these needles are very heavy and of larger diameter than the thread these holes cause spaces to remain about the threads at the points where they pass through the layers of the material. The sealing strip material is such, however, that the needle holes close tightly about the thread, as at 18, after the needle is withdrawn. Also the compressive action of the stitching operation compresses the sealing layers so that they exert outward pressure on the seam structure to hold the stitches tight and compress the layers into tight conforming relation to each other. Consequently the ends of the needle holes 19 in the tubing material are effectually plugged by the elastic material which tends to flow into these hole ends under the expansive action of the compressed sealing layers.

While I have referred to the sealing strip material as a rubber coated fabric, it will be understood that any suitable material may be employed for this purpose, as long as it has the necessary pliability and resilience, has the characteristic that it will permit a hole to be punched therein, such as a needle hole, and will then close in tightly sealed relation around a thread engaged through the hole, and is of such nature that it may be cut into strip form and handled with facility while in a relatively dry state. While rubber in various states and other materials may be employed, a satisfactory material for the purpose is pure gum rubber, preferably uncured, and used as an all-rubber strip or as a coating over a fabric base. This may be of a self-curing type which will cure up after incorporation in the seam, this type having a longer life than the uncured type.

In Fig. 4 I have shown a modification in which the inverted U-shape sealing strip 13 is engaged over one longitudinal marginal edge portion 11 of the ventilating tubing, while the other marginal edge portion 12 is engaged with one side of the sealing strip 13 and is provided with an integral extension 20 which is carried over the reinforcing rope 15, and is then carried downwardly into engagement with the other side of the sealing strip, the two rows of stitching 16 and 17 being engaged through the several layers of the seam in a similar manner to the first embodiment. In this arrangement the separate covering strip 14 employed in the first embodi-

ment which encloses the sealing strip 13 at its outer sides to form a compressive member therefore is dispensed with, and the marginal portion 12 and its integral extension 20 are employed for the same purpose, so that when the layers are compressed through the stitching operation the sealing strip becomes compressed and thereupon exerts outward pressure to cause the stitching to become tight and the several layers to be tightly pressed into conforming engagement with each other. Thus the elastic material of the sealing strip which closes about the stitching threads as at 18 constitutes a plug means for the ends of the open spaces 19 of the needle punch holes in the tubing material, so that these holes are effectually sealed against air leakage.

In Figs. 5 and 6 I have illustrated modifications in which the rope member 15 is dispensed with, these modifications corresponding otherwise to the embodiments of the invention illustrated in Figs. 3 and 4 respectively. In these modifications grommets or other suitable suspension means may be incorporated in the seam.

I have illustrated and described preferred and satisfactory embodiments of the invention, but it will be obvious that changes may be made therein, within the spirit and scope thereof, as defined in the appended claim.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

In a flexible air-conducting ventilating tubing wherein the tube is formed from a strip of relatively thick substantially non-resilient woven fabric material incapable of substantial contraction to self-seal needle holes made therethrough having its longitudinal marginal edge portions brought together along a seam, a seam structure comprising an inner longitudinal two-layer fin formed from said marginal edge portions of said tube, an inverted U-shaped sealing strip engaged about said fin formed from pliable resilient material capable of contraction to self-seal needle holes made therethrough, an inverted U-shaped covering strip engaged over said sealing strip and also formed from a strip of thick substantially non-resilient woven fabric material incapable of substantial contraction to self-seal needle holes made therethrough, and needle-applied thread stitching extending through and securing the layers of said seam, the thread-applying needle being of greater thickness than the thickness of the thread, the needle-produced holes through said covering strip and fin being larger than the thread thickness through the incapacity of the material of the covering strip and fin to contract, and the needle-produced holes through said sealing strip being tightly engaged by said thread through the capacity of the material of the sealing strip to contract, and the relatively larger needle-produced holes in said covering strip and fin having their ends contiguous to said sealing strip plugged by the sealing strip material surrounding the relatively smaller needle-produced holes in said sealing strip.

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