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GAS CLEANING APPARATUS
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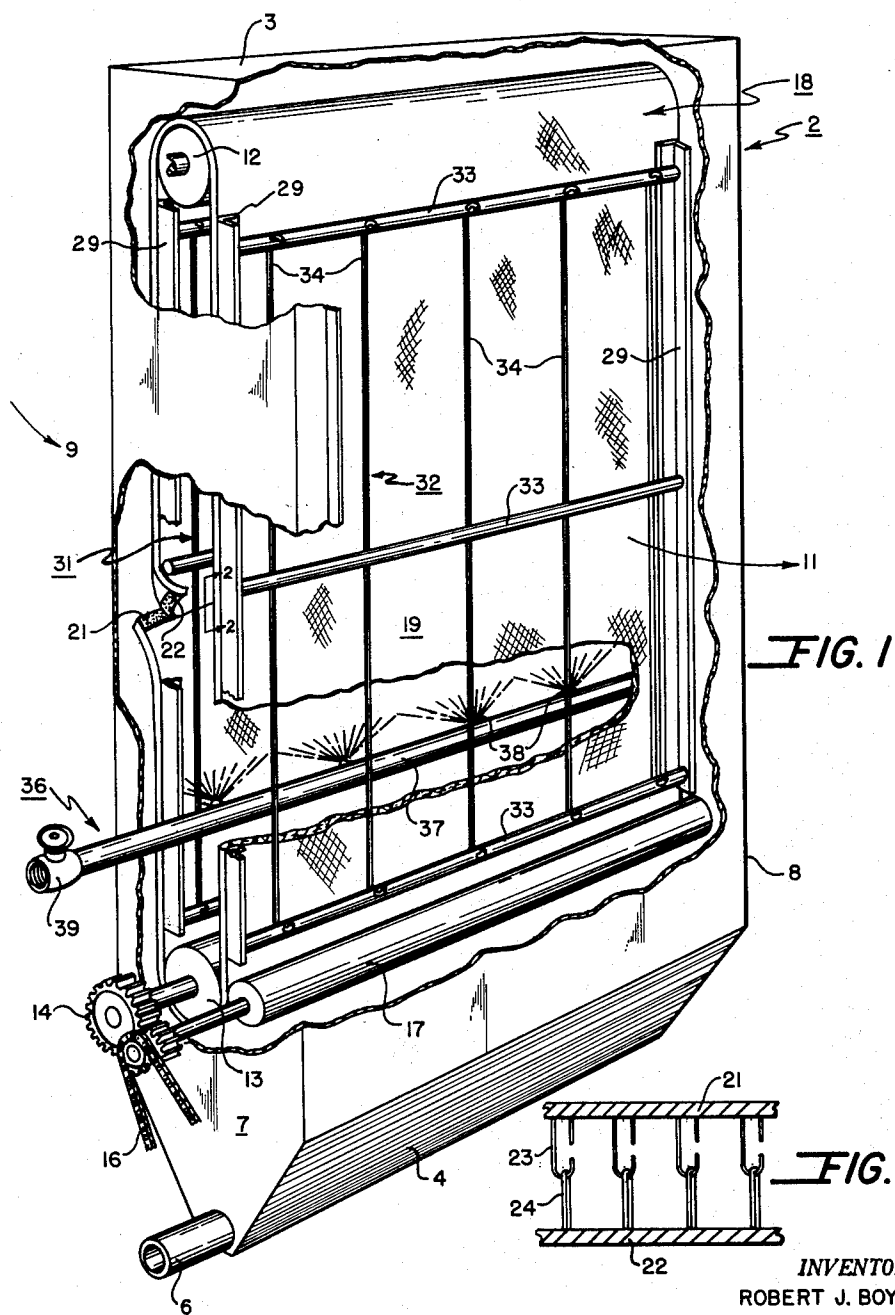


FIG. 1

FIG. 2

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GAS CLEANING APPARATUS

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The present invention relates to gas cleaning apparatus and more particularly to improved gas cleaning apparatus of the type having movable filter medium in the form of an endless belt.

In accordance with the present invention, an improved straightforward and efficiently operated structure is provided for removably fastening opposite ends of a filter medium strip which is utilized to form an endless belt. The present invention further provides a novel arrangement which allows for the simultaneous movement of a filter medium belt through a gas stream to be treated, insures that the opposite ends of such belt are maintained in securely fastened position and insures that any excess filter treating liquids are removed. In addition the present invention provides a novel material for use as an endless filter belt, the material permitting comparatively high filtering efficiency with low resistance to gas flow and being readily adaptable to both dry and viscous impingement type gas filtering.

Various other features of the present invention will become obvious to one skilled in the art upon reading the disclosure set forth hereinafter.

More particularly, the present invention provides a gas cleaning apparatus comprising a pair of spaced support rolls positioned on opposite sides of a gas stream to be treated, a strip of polyurethane filter medium disposed about the support rolls with the opposite ends thereof spaced in overlapping position, means for fastening overlapping ends of the strip together to provide an endless filter belt, the fastening means including a first tape member fastened to one overlapping end of the filter strip, the first tape member being provided with a first series of fastener elements in a form of interlockable pile threads, a second tape member fastened to the other overlapping end of the filter strip, the second tape member being provided with a second series of fastener elements in the form of interlockable pile threads removably engageable with the first series of fastener elements to provide the endless filter belt, and means to move a portion of the filter belt into and out of the gas stream to be treated.

It is to be understood that various changes can be made in the arrangement, form and construction of the apparatus disclosed herein without departing from the scope or spirit of the present invention.

Referring to the drawings which disclose one advantageous embodiment of the present invention:

FIGURE 1 is a partially broken away perspective view of a gas cleaning apparatus incorporating the features of the present invention; and,

FIGURE 2 is a greatly enlarged cross-sectional view taken in a plane passing through line 2—2 of FIGURE 1, disclosing the hook-shaped pile threads of facing tape members at opposite ends of the strip in interlocking engagement.

As can be seen in FIGURE 1, vertical housing 2 is disclosed including roof 3, trough-like bottom 4, liquid drain 6, and side walls 7 and 8. Vertical housing 2 is provided with upstream gas inlet 9 and downstream gas outlet 11. Mounted within the upper and lower portions of housing 2 are spaced support rolls 12 and 13, respectively. These support rolls, which advantageously can be made from a suitable steel material, are rotatably mounted in housing 2 in bearing blocks (not shown) so that they

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can rotate about their longitudinal axes, the lower roll 13 being driven through gearing 14 and chain drive 16 connected to a suitable motor (not shown).

Extending parallel to and adjacent support roll 13 in close relationship therewith is squeeze roll 17. Roll 17, like rolls 12 and 13, also is rotatably mounted in housing 2 for rotational movement about its longitudinal axis through means of suitable bearing blocks (not shown). Roll 17 advantageously can be made from any one of a number of hard rubber compositions and, like roll 13, is driven by gearing 14, the rolls 13 and 17 cooperating, in turn, to drive endless filter medium belt 18 which passes therebetween.

Belt 18 which can be made from any one of a number of suitable strips of filtering material and, as is described hereinafter, can advantageously be made from an elastic type foam polyurethane, is comprised of a longitudinally extending filter strip 19 having fastening members 21 and 22 mounted at opposite ends of the strip. Advantageously, strip 19 is sized to extend around support rolls 12 and 13 so that fastening members 21, 22 are in overlapping position to face each other when the strip is held in taut position.

Fastening members 21 and 22 are arranged to include a mating series of hook and eye-shaped pile threads 23 and 24, respectively, the pile threads engaging in interlocking fashion when fastening members 21 and 22 are brought into facing contact. In this connection, attention is directed to U.S. Patent No. 2,717,437, issued to George De Mestral on September 13, 1955, which suggests hook-shaped pile thread tape similar to that aforescribed.

Once the mating series of hook and eye-shaped pile threads 23 and 24 are in interlocking engagement, endless belt 18 is formed. Since strip 19 is so sized and fastening members 21 and 22 are so positioned to provide a taut belt, an effective gas seal can be maintained between the downstream surfaces of the upstream and downstream flights of belt 18 and pairs of sealing members 29 positioned adjacent such downstream surfaces of the flights. Sealing members 29 are in the form of longitudinally extending strips, each having a right angle cross section with one leg fastened to a side housing 2 and the other extending against the adjacent downstream surface of the adjacent flight of belt 18.

To further support the upstream and downstream flights of endless belt 18, suitable support members 31, 32, respectively, are provided. The support members 31, 32 include spaced transverse support rods 33 connected to and extending between the sides 7 and 8 of housing 2. Connected to and extending transverse such support rods along the line of movement of filter belt 18, are spaced transverse support wires 34.

It is to be noted that a suitable liquid supply conduit means 36 is provided in the lower portion of housing 2 intermediate the upstream and downstream flights of belt 18. Conduit means 36 includes conduit pipe 37 having fixed thereto, in spaced relationship, spray nozzles 38 adapted to spray a flat sheet-like spray against the interior surface of the upstream flight of filter belt 18, the conduit being connected to a suitable source of liquid supply (not shown). A valve member 39 is provided in the conduit to permit manual on-off control of liquid fed to the filter belt. It is to be understood that other liquid supply arrangements can also be utilized in the embodiment disclosed. For example, a liquid spray system comparable to that aforescribed can be utilized on the upstream side of the upstream flight of the filter belt in cooperation with the conduit aforescribed to remove any particles that have accumulated along such upstream surface. It further is to be understood that the conduit system described can be used to supply a suitable washing

liquid, such as water, to the belt or it can be used to supply a suitable viscous liquid to the belt, when the installation is to be used for viscous impingement type operations.

As above noted, filter belt 18 can be made from any one of a number of suitable filtering materials and advantageously it can be made from an elastic foam polyurethane material, the elasticity permitting the belt to be stretched between spaced support rolls 12 and 13 to insure tight sealing along seal members 29. In addition, foam polyurethane material provides a maze of interconnected cellular members which permit ready cleaning and drainage, particularly when the material is taut, and which offer a comparatively low resistance to air flow with high dust removal efficiency. Further, the cellular construction of polyurethane material can be controlled chemically to produce cellular passages preselected in accordance with the stream to be filtered, such material being readily converted from use as a dry type filter to use as a viscous type impingement filter.

In a typical run of the disclosed apparatus in dry type filtering operations, the filter belt can be rotated through the drive roll arrangement 13, 17 to pass through a complete cycle every eight (8) hours with the dirty gas flow on. The gas flow then can be interrupted and a washing liquid delivered through the conduit means to wash the belt clean of any dirt collected thereon, the belt being accelerated to rapid rotation for a period of six (6) minutes to effect a thorough washing operation. The washing liquid is then stopped and the gas again turned on for filtering operations. It is to be understood that the cycle of operations can be entirely different for viscous impingement type filtering operations, a suitable viscous material being supplied through the conduit means as the belt moves continuously in a slow manner over an extended period of time. It is to be noted that in both types of operations abovescribed, the support-squeeze roll drive arrangement 13, 17 of housing 2 serves to insure fast interlocking of hooks and eyes 23, 24 on tapes 21, 22 of belt 18. Further, the support-squeeze rolls serve to remove any excess liquid that might have accumulated on the belt before the belt is returned to the gas stream being treated.

The invention claimed is:

1. A gas cleaning apparatus comprising a pair of spaced support rolls positioned on opposite sides of a gas stream to be treated, at least one of said support rolls having an adjacent squeeze roll cooperating therewith, a strip of filter medium disposed about said support rolls to pass between said support roll and said squeeze roll with opposite ends thereof placed in overlapping position, means for fastening said overlapping ends of said strip together to provide an endless filter belt, said fastening means including a first tape member fastened to one overlapping end of said filter strip, said first tape member being provided with a first series of fastener elements in the form of interlockable pile threads, a second tape member fastened to the other overlapping end of said filter strip, said second tape member being provided with a second series of fastener elements in the form of interlock-

able pile threads engageable and disengageable with said first series of fastener elements to provide said filter belt, and means to move said filter belt through said gas stream to be treated and between said support-squeeze rolls to insure firm engagement of said first and second fastening elements.

2. The apparatus of claim 2, and filter belt liquid treating spray means positioned upstream of said support-squeeze rolls whereby said support-squeeze rolls further serve to squeeze out excess liquid sprayed on said filter belt.

3. A gas cleaning apparatus comprising a housing having an upstream gas inlet and a downstream gas outlet to define a path for a gas stream to be treated, a pair of spaced support rolls rotatably positioned in said housing on opposite sides of said gas stream to be treated, at least one of said support rolls having an adjacent squeeze roll cooperating therewith, a strip of compressible-expandable filter medium disposed about said support rolls to pass between said support roll and said squeeze roll with opposite ends thereof placed in overlapping position, means for fastening said overlapping ends of said strip together, said fastening means including a first tape member fastened to one overlapping end of said filter strip, said first tape member being provided with a first series of fastener elements in the form of interlockable pile threads, a second tape member fastened to the other overlapping end of said filter strip, said second tape member being provided with a second series of fastener elements in the form of interlockable pile threads engageable and disengageable with said first series of fastener elements to provide said filter belt, filter belt liquid treating spray means disposed within said housing upstream of said support-squeeze rolls, and means to rotate said support-squeeze rolls and move said filter belt therebetween whereby said filter belt is passed through said gas stream and said support-squeeze rolls to insure firm engagement of said fastening elements and to squeeze excess liquid sprayed on said filter belt.

4. The apparatus of claim 3, and sealing members mounted in said housing to extend along opposite sides of said gas flow stream adjacent to and in alignment with the longitudinal edges of said filter belt, said filter belt being arranged to surround said support rolls in taut position so as to move in sealed engagement with said sealing members.

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