April 30, 1940. J. H. FEDELER, JR 2,198,912

FILTER CAKE REINFORCEMENT

Filed April 9, 1938

Fig. 1.

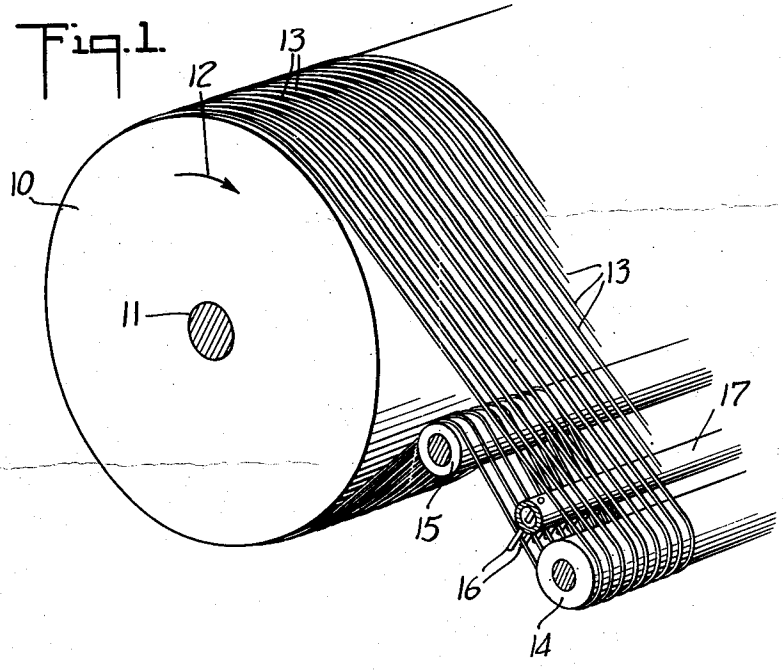
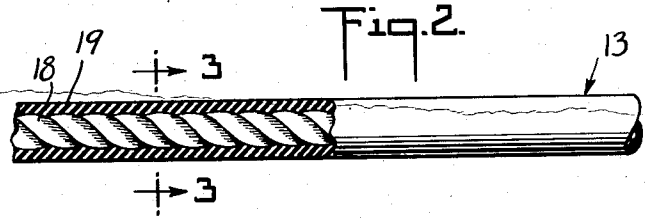


Fig. 2.



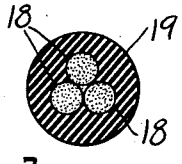


Fig. 3.

INVENTOR
John H. Fedeler, Jr.
BY
Gluck & Breitenfeld
ATTORNEYS

Patented Apr. 30, 1940 2,198,912

UNITED STATES PATENT OFFICE

2,198,912

FILTER CAKE REINFORCEMENT

John H. Fedeler, Jr., Ridgewood, N. J., assignor to Thos. C. Stephens, Scarsdale, N. Y.

Application April 9, 1938, Serial No. 201,964

3 Claims. (Cl. 210—199)

My present invention relates generally to filters and has particular reference to rotary-drum filters of the general type illustrated and described in United States Patent No. 1,880,005, issued September 27, 1932.

It is a general object of my invention to provide certain improvements in the type of filter in which a series of flexible elements extend around the filter drum, these elements being adapted to become embedded in the filter cake that forms on the drum, thereby serving not only as a reinforcement for the filter cake but as a convenient means for stripping the cake from the drum and also conveying it along a predetermined path of travel to an ultimate region of discharge.

A filter of the foregoing type has come to be known in the trade as a "string-discharge" filter, because the flexible elements are usually composed of a series of strings.

The string that is used is generally of cotton or linen or equivalent materials, and preferably of stranded character, i. e., it is composed of a series of individual strands that are twisted or braided together.

It has been found in practice that the maximum inherent advantages of this type of construction are not always capable of realization, for various reasons. For example, the employment of a string composed of metal, such as a stranded copper wire, a coiled spring, etc., has usually proved to be impractical. Among other difficulties is the fact that a metallic string has an undesirable abrasive effect upon the screen or mesh that serves as the filtering medium.

Similarly, where a non-metallic string is used, the field of utility is subject to certain limitations. For example, in the filtration of certain slurries, notably those which are markedly alkaline or acid in character, the chemical action has an undesirably deleterious effect on the strings. Also, a non-metallic string is not always capable of adequately withstanding the abrasion to which it is subjected, particularly where the filtration is intended for use in the mining field.

A non-metallic string is also subject to certain other disadvantages. Thus, where the material being handled by the filter is of a fibrous nature, as in the paper industry, the inherent fibrous nature of a non-metallic string, coupled with the natural tendency of the string during normal operation of the filter to rotate about its own axis, induces the formation on the string of undesirable fibrous masses known in the trade as "pussy-cats," these being nothing more or less than a collection of fibers that have wrapped themselves around the string and become entwined with it.

Another disadvantage of the ordinary non-metallic string lies in the fact that its ends have a tendency to fray, whereby the knot uniting the ends of the string loosens and ultimately becomes untied within an undesirably short period of time.

It is the general object of the present invention to obviate these and other difficulties heretofore encountered in connection with a "string discharge" filter, thereby widely extending the field of practical utility of this general type of filter.

In seeking to achieve the present objectives, I have found that the mere impregnation of the strings with various protective media is unsuitable to accomplish the present purposes, because the abrasive action to which the strings are subjected during normal operation of the filter quickly ruptures any protective film that the impregnation may have produced.

In accordance with my present invention, the string is provided with a coating of material which is truly protective in nature. The coating I employ is of impervious flexible material which is resistant to chemicals which would attack the string itself, and which is adequately resistant to the abrasion to which the flexible reinforcing elements may be subjected either during normal operation of the filter or in the filtering of abrasive products such as those encountered in the mining field. Moreover, the present coating has a smooth non-fibrous quality which is not subject to fraying, and which has no tendency to pick up and accumulate undesirable masses of fibrous material. Where the string is of metallic character, the present coating serves as a desirable protective sheath which overcomes the difficulties heretofore making metallic strings impractical by themselves.

One of the features of my invention lies in ensheathing each string in a protective coating which is bonded to the string. The bonding effect is preferably accomplished by employing a plastic material that is molded into position on the string so that the inner surface of the resultant homogeneous coating conforms snugly to the outer surface of the stranded string. In this way, a staunch unitary reinforcing element is produced, of adequate flexibility and tensile strength, having a minimum of stretchability, and admirably manifesting the qualities of resistance to chemical action and to abrasion which

are among the major objectives of the present invention.

The coating material which I prefer to employ is vulcanized soft rubber or its equivalent.

I achieve the foregoing objects, and such other objects as may hereinafter appear or be pointed out, in the manner exemplified in the accompanying drawing, in which—

Figure 1 is a fragmentary perspective view, diagrammatic in nature, of a rotatable drum and associated parts of a filter of the present type;

Figure 2 is an enlarged fragmentary view of an illustrative example of one of the present improved flexible reinforcing elements, shown partly in section; and

Figure 3 is an enlarged cross-sectional view taken substantially along the line 3—3 of Figure 2.

The reference numeral 10 is applied to a drum of a filter of the present type, being rotatable about a shaft or axis 11. The details of the drum construction, and of its mounting in a slurry tank, have not been illustrated since these details are known per se and have no direct bearing on the present invention. It will be understood, however, that the drum is mounted to rotate around a substantially horizontal axis with its lower portion immersed in the slurry which is to be filtered. The drum rotates in the direction of the arrow 12, is provided on its surface with a suitable screen or filtering medium, and is usually provided with vacuum producing mechanism and conduits which draw the filtrate inwardly through the surface of the drum, leaving the residue in the form of a filter cake on the drum surface.

Extending around the drum are a plurality of parallel flexible elements 13 adapted to become embedded in the filter cake that is formed, thereby reinforcing the latter and serving as a means to guide the resultant filter cake away from the drum.

Merely by way of example I have shown the flexible elements 13 traveling tangentially away from the drum 10, around a roller 14 of relatively small diameter, thence over a guide roller 15 and back onto the drum 10. During the passage of the elements 13 around the roller 14, the filter cake breaks away from the flexible elements because of the sharp curvature of travel around the roller 14. During the passage of the flexible elements from the roller 14 to roller 15 they are guided between successive prongs or teeth 16 of an element 17, thus serving to keep the flexible elements in proper spaced relationship.

Merely by way of example I have illustrated the present invention in the form it assumes when the flexible element comprises a stranded string 18 (see Figures 2 and 3) ensheathed in a protective coating 19.

I have illustratively shown a string 18 composed of three twisted strands, as shown most clearly in Figure 3, although it will be understood that the string may be composed of fewer or more strands, and that the latter may be twisted or braided or otherwise inter-twined or associated in any suitable or conventional manner.

It will be understood that the string 18 may be of the usual cotton or linen variety, or it may be metallic in nature, being composed, for example, of a stranded or braided copper wire, a coiled spring, or the like. In general, it will be understood that the term "string" as used herein and in the appended claims is intended to signify any flexible element that is suitable for the present purpose.

The protective sheath 19 is composed of a homogeneous material which is resistant to the chemicals which would attack the string itself, which is flexible, and which is sufficiently tough to withstand the normal abrasion to which it is subjected in action. I have found that vulcanized soft rubber, or its equivalent, is suitable for this purpose.

It is a particular feature of my invention to apply this sheath in plastic form, preferably under pressure, so that it is virtually molded into position on the string. This is illustrated clearly in Figures 2 and 3, and attention is drawn to the fact that the inner surface of the coating 19 conforms snugly to the outer surface of the string. As a result, the coating is bonded to the string not only by virtue of the adhesion that may exist between the string and the coating, but also by the form-fitting relationship between the parts. A unitary flexible element is thus produced, with no relative longitudinal slippage between the sheath and the string. The element has adequate flexibility, it has less stretchability than the string itself, it is resistant to abrasion, and, of considerable importance, it is resistant to chemical action.

The flexible element thus produced has certain other advantages. Its outer surface is of smooth non-fibrous character so that it has no tendency to ensnare masses of fibrous material; it has no abrasive action upon the filtering medium itself; it has no tendency to fray either at the ends or elsewhere; and it is of a character which permits the core to be of metal or other selected material which might, by itself, be unsuitable for use on a filter.

For these reasons, the improved reinforcing element is admirably adapted to serve in all types of "string discharge" filters, and is particularly useful where the filter is to be used with alkaline or acid media, e. g., in the filtering and washing of caustic lime mud in the paper industry, in the filtering and washing of zinc sulphate in the manufacture of paint pigments, and in a large variety of other arts and industries.

It is to be understood that the use of the present improved reinforcing element is not restricted to a filter in which the flexible elements travel as shown in Figure 1. For example, the discharged reinforced filter cake may be conveyed from the filter drum to a drying drum, or it may be stripped from the reinforcements by means other than the small-diameter roller illustrated merely by way of example in the present drawing.

In general it will be understood that the details herein described and illustrated for the purpose of explaining the general nature of the invention, may be modified by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims and that these details are to be interpreted in an illustrative, and not in a limiting sense.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In a rotary-drum filter, a series of parallel flexible elements extending around the drum and tangentially away from it, said elements being adapted to become embedded in the filter cake that forms on said drum and serving thereby to reinforce the cake and strip it from the drum,

each element comprising a string ensheathed in a tough homogeneous flexible material having a smooth surface resistant to abrasion and devoid of any tendency to pick up undesirable matter that would ordinarily tend to adhere to the string itself, whereby both the string and the filter parts with which said element comes in contact during the normal operation of the filter are effectively shielded from such undesirable matter.

2. In a rotary-drum filter, the combination set forth in claim 1, said sheath comprising a plastic material molded into position on the string so that it is bonded to the string with its inner surface conforming snugly to the outer surface of the string.

3. In a rotary-drum filter, the combination set forth in claim 1, said sheath comprising vulcanized soft rubber or its equivalent, bonded to the string with its inner surface conforming snugly to the outer surface of the string.

JOHN H. FEDELER, JR.