Jan. 27, 1970 E. N. COLBURN ET AL 3,491,888

SELF-CLEANING SCREEN BASKETS

Filed Dec. 27, 1968 2 Sheets-Sheet 1

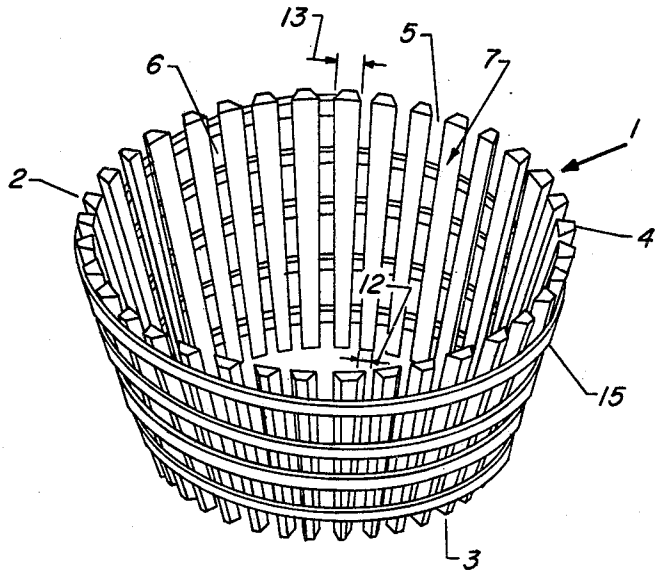


Figure 1

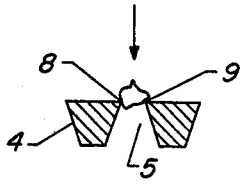


Figure 2

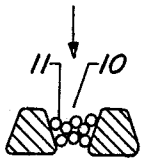


Figure 3

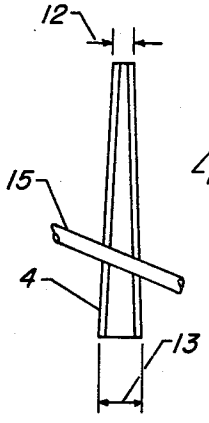


Figure 4

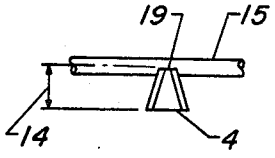


Figure 5

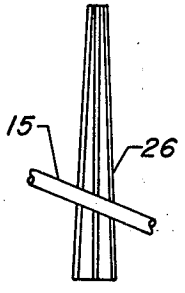


Figure 6

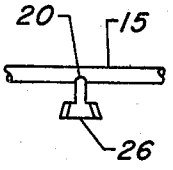


Figure 7

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SELF-CLEANING SCREEN BASKETS

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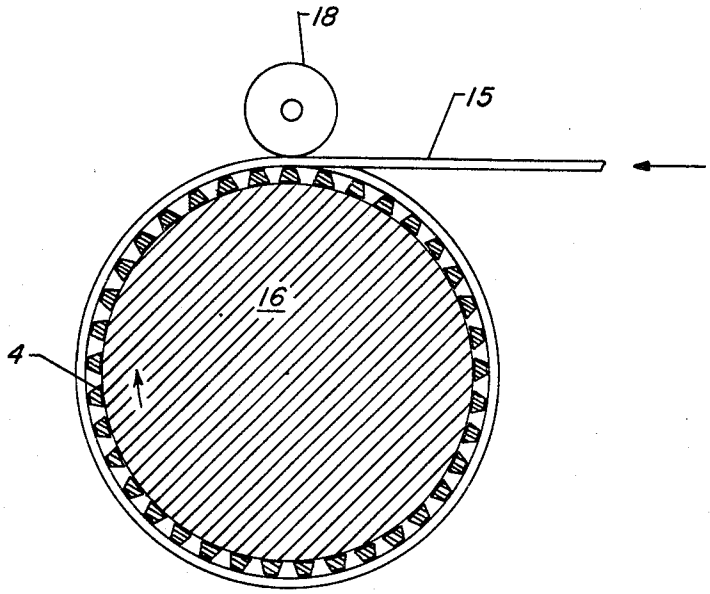


Figure 8

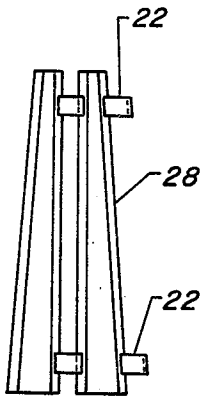


Figure 9

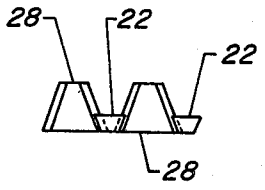


Figure 10

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SELF-CLEANING SCREEN BASKETS

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U.S. Cl. 210—380 5 Claims

ABSTRACT OF THE DISCLOSURE

A self-cleaning conical shaped screen basket adaptable for centrifuge operations which embodies a slotted construction to provide a self-cleaning V slot that enlarges in the outward radial direction. The slot forming, wedge-shaped rods are tapered so that the resulting slot opening on the inner periphery of the screen is uniform in width throughout. In the preferred embodiment, a support wire is wound continuously around the rods and fused to them so as to hold them in a rigid manner.

This invention relates to an improved form of a self-cleaning screen basket used primarily in centrifugal driers.

In its preferred form, the screen basket has a configuration of a truncated cone. In a typical application, such as coal dewatering, the cone-shaped screen basket is clamped or bolted into a centrifuge. During the operation of the centrifuge, the basket is spun about its axis of rotation, while the material to be dried is fed into the interior of the small end of the basket. Centrifugal force causes water and finer materials to flow radially outwardly passing through the screen, while the remaining sludge is driven longitudinally through the basket because of its expanding diameter.

Heretofore, there have been basically three types of conical screen baskets available for centrifuge applications: the woven cloth basket, the perforated metal basket, and the rigid panel screen basket, which is made of segments of screen similar to the type described in Johnson Patent 2,046,458. The latter has been the preferred type of basket because of its high screening efficiency and long life characteristics.

Briefly, the panel screen basket heretofore used is made of many segments of self-cleaning, continuous slot screens welded together in a conical shape. The straight continuous slots of the screen segments are arranged so that they run primarily in a longitudinal or axial direction. It has been found that greatest screening efficiency can be obtained when the slots run in this direction as opposed to a circumferential direction; i.e., rotation of the screen basket about its axis of rotation will, in effect, decrease the slot width because material flow will have a velocity direction at nearly right angles to the slots.

On the other hand, the panel type screen basket does have disadvantages inherent in its configuration. Since it is made of many flat screens reformed into a conical shape, the direction of the slots will necessarily be varied; some will be more axial than others. Hence, the screening efficiency will not be as great as a screen where the slots are running in a true, axial direction.

In addition, manufacturing panel screen baskets requires a cutting, a reshaping a welding operation, all operations to take place after the original screen segments have been assembled and welded. These operations are time consuming and also introduce possible points of weakness into the structure of the basket.

It is thus a principal object of this invention to provide for a rigid wire screen basket of the self-cleaning type, having high screening efficiency and long life characteristics

and, in addition, being adaptable to economical manufacturing steps.

More specifically, it is an object of this invention to provide for a conically-shaped screen basket suitable for centrifuge applications, having self-cleaning slots adaptable for in-to-out flow, the self-cleaning slots all running in a true axial direction.

It is a further object of this invention to provide for a screen basket that can be made by relatively simple operations using conventional manufacturing methods.

Broadly, this invention is a conically-shaped, self-cleaning screen basket, comprising a plurality of longitudinal closely spaced apart wedge-shaped rods that are arranged along the periphery of a truncated cone, having the base side of each wedge-shaped rod tangent, along its entire length, to said truncated cone, said rods forming a plurality of V slots, the cross-sectional area of said V slots formed increasing in the outward radial direction, and in addition said wedge-shaped rods are tapered along their entire length, said taper related to the changing diameter of the resulting conical screen so that the slot openings along the inner surface of the basket are of a programmed width throughout their entire length, said wedge-shaped rods are made rigid by a support wire means which has been wound around said longitudinal wedge-shaped rods and fused to said rods at the junctions of said rods and said support wire.

The screen basket can be assembled by various methods, as for example, one means will consist of clamping the wedge-shaped rods around a form at predetermined distances apart and winding and fusing a support wire to each junction of bar and wire. The kind of material used in the construction of the basket will depend upon its ultimate use and on the fusing capabilities of the material used. The fusing will normally be done by an electrical resistance means or by an ultra-sonic means. Except for the initial material placement, most of the operation herein described is fully automatic and is therefore quite economical.

The V slots formed by the bars have their narrow opening on the inner periphery of the screen basket, thereby establishing self-cleaning slots. In addition, in its preferred form, the wedge-shaped bars are tapered, the taper being programmed so as to form a uniform slot size when the bars are placed axially tangent to the cone. However, the fact that the screen basket heretofore described is cone shaped and the V slots are of uniform size should not be a limiting factor in respect to this improvement, since a tapered slot is also contemplated within the scope of this improvement. All the slots are axial, thereby satisfying the basic object requirement of high screening efficiency. In addition, no reshaping or rewelding is required to form the resulting screening; therefore, the possibility of a structural breakdown is minimized.

In another embodiment of the basket the wedge-shaped rods are provided with projections or other similar spacers around their sloping sides. These projections will establish spacing means to provide for initial placement of the rods on the form during assembly.

The tapered, wedge-shaped rods may be formed in various ways. Typically roll-forming or molding is the operation employed. However, in a unique embodiment, the wedge-shaped rods are made in a T shape, having a rib section perpendicular to a substantially thin wedge-shaped section. This permits the taper shape to be formed by a blanking operation.

Reference to the accompanying drawing and to the following description will serve to more fully illustrate the design and construction of the various embodiments of the present invention, as well as to assist in pointing out advantageous features in connection therewith.

DESCRIPTION OF DRAWING

FIGURE 1 is a perspective type view of a embodiment of the conically-shaped screen basket with a multiplicity of V slots formed to increase in area radially outwardly, as well as having a constant slot opening.

FIGUE 2 is a schematic cross-sectional view of a V slot as provided by the screen basket of FIGURE 1.

FIGURE 3 is a scematic cross-sectional view of a slot used in a screen not having the proper form of V slot and showing material bridging characteristics of such slots.

FIGURE 4 is a schematic elevational view of a wedge-shaped rod used in the embodiment of FIGURE 1.

FIGURE 5 is a schematic end view of a tapering wedge-shaped rod as used in the embodiment of FIGURE 1.

FIGURE 6 is a schematic elevational view of a wedge-shaped rod embodiment having a T for welding purposes and strength.

FIGURE 7 is a schematic end view of the embodiment of FIGURE 6.

FIGURE 8 is a sectional view showing a schematic representation of the method of assembling the screen basket disclosed herein.

FIGURE 9 is a schematic elevational view of a wedge-shaped rod embodiment having small spaced projection means to provide for spacing between rods.

FIGURE 10 is a schematic end view of the embodiment of FIGURE 9.

Referring now particularly to FIGURE 1 of the accompanying drawing, there is shown a screen basket **1** shaped as a truncated cone. The conical shape is manifested by the fact that the end area **2** on the top side is larger than end area **3**. While FIGURE 1 illustrates the preferred edge of the basket as a truncated right circular cone, it is contemplated that other geometric variations may be suitable for a screen basket. As examples, the circular areas of the cone may be made elliptical, or instead of a right angled cone, the end areas may be oblique to the axis of rotation. It is also possible to vary the relationship of the end areas to the length of the cone. A more pronounced cone shape may be formed by having substantially different sized end areas, while a shape of a cylinder may be approached by equating their size.

The basket **1** is made of a plurality of wedge-shaped rods **4** that are spaced around the surface of a cone in such a manner that they are longitudinally tangent to the cone along their entire length. The wedge-shaped rods **4** are placed to form V slot **5** with the narrow opening **6** of the slots on the inner periphery of the resulting basket **1**. These V slots serve as self-cleaning slots when material flow initiates from the interior zone **7**. In the event that a particle temporarily catches itself at one point along a slot, other particles will tend to free it, because the slots are continuous along their entire length, and there are no barriers to wedge them in place as evidenced in perforated type screens. The possibility of a particle catching in the V slot is further reduced, since at any one location along a slot entrance or opening, there are only two points **8** and **9** of contact for the particle to catch and no depressed zone **10** to permit particle bridging buildup **11**, such as shown in FIGURE 3. Actually, when any particles do pass through the narrow slots, then they will continue outward in the enlarging V opening to preclude any blocking.

In the preferred embodiment, it is to be noted, that the wedge-shaped rods **4** are also tapered along their entire length, the tapers being indicated by the change in dimensions **12** and **13**. The tapering of the bars is only done in the lateral or tangential direction, leaving the height **14** uniform over the entire length. The uniform height should not be a limiting factor with respect to this invention, since an alternative embodiment with tapered height is contemplated within the scope of this invention, albeit, such a bar would be structurally weaker than the bars in the present embodiment.

The tapering of the rods **4** is related to the changing diameter characteristic to the cone. Preferably, the relationship is such that the decreasing size of the bars coupled with the decreasing diameter of the screen will establish a slot opening **6** of constant size along the entire length of the screen. Since in the preferred embodiment the heights of the rods **4** are uniform, the volume or cross-sectional area of the slots **5** will also be uniform along the entire length of the screen. This relationship establishes parameters around which a durable screen, with constant slot size, can be manufactured. On the other hand, it is quite evident that if design considerations call for varying slot openings in a screen basket, a taper can be programmed to establish that particular slot opening.

The wedge-shaped rods **4** are maintained in a rigid manner by a support wire **15** of approximately the same cross-sectional area as the rods. In the embodiment of FIGURE 1, the wire **15** has been wound helically around the rods **4** and attached to the rods at each junction through a fusing means. The method of fusing or welding will necessarily depend upon the type of material used in forming the screen, i.e., a metallic screen will be susceptible to electrical resistance welding while a plastic screen will be susceptible to ultra-sonic fusing.

The method by which the screen can be assembled is generally known and is shown schematically in FIGURE 8. The method includes, placing of the wedge-shaped rods **4** around a conically-shaped mandrel or form **16**, clamping the rods **4** in position through a means not shown, rotating the mandrel about its axis of rotation and winding the support wire **15** around the rods **4**. The mandrel and pressure applying means **18** move longitudinally relative to each other, so that the wire **15** will wind in a continuous helical manner. The fusing means is incorporated into the pressure applying means **18**, which presses the wire to the wedge-shaped rods. As the wire is pressed against a rod, an electrical resistance of ultrasonic vibration fuses the wire and rod into each other as shown at points **19** and **20**, FIGURE 5 and FIGURE 7.

The tapered, wedge-shaped rods used to form the screen basket can be formed in various ways. If the basket is to be made of a plastic, injection molding is best suitable for forming a tapered rod. A steel wire may be roll-formed into the taper shape. It is also possible to form a T wedge-shaped rod as shown in FIGURE 6 and FIGURE 7. The T shape of rod **26** gives the rod the needed radial strength and in addition allows the taper to be formed by relatively simple blanking techniques.

Preferably the wedge-shaped rods will be maintained at a predetermined distance apart from each other during the assembly operation by providing a slotted mandrel and clamp means, in which the rods are placed. A novel rod design will eliminate the need for providing for a slotted mandrel or clamp means. The embodiment of this rod is illustrated in FIGURE 9 and FIGURE 10. In this embodiment, suitable projections **22** are located at predetermined distances along the length of the wedge-shaped rods **28**. These projections are located on one side of each rod and at the same point; however, alternatively, projections may be located on both sides. When the rods of this embodiment are placed on the mandrel between the clamp means, the rods will automatically be spaced apart at a predetermined distance.

Although I have described the present invention with a certain degree of particularity it is understood that various minor modifications may, of course, be made in the details of construction, and the combination and arrangement of parts without departing from the spirit and the scope of the invention; for example, the support wire need not be a continuous helical winding, since it might well be broken into a series of discontinuous strips or sections.

We claim as our invention:

1. A conically-shaped self-cleaning screen basket comprising a plurality of longitudinal closely spaced apart

wedge-shaped rods arranged along the periphery of a truncated cone, the base side of each wedge-shaped rod being tangent along its entire length to said truncated cone, said rods forming a plurality of V slots, the cross-sectional area of said V slots, increasing in the outward radial direction, said wedge-shaped rods being tapered along their entire length, said taper being related to the changing diameter of the resulting conical screen so that the slot openings along the inner surface of the basket are of a programmed width throughout their entire length, said wedge-shaped rods being made rigid by a support wire means wound around said longitudinal wedge-shaped rods and fused to said rods at the junctions of said rods and said support wire.

2. The conically-shaped screen basket of claim **1** further characterized in that the slot openings along the inner periphery of the basket are of a constant width throughout their entire length.

3. The conically-shaped screen basket of claim **1** further characterized in that the support wire means is wound helically around said longitudinal wedge-shaped

rods in a continuous manner and in fused to said rods at each junction of said rods and said support wire.

4. The conically-shaped screen basket of claim **1** further characterized in that the wedge-shaped rods have a cross-sectional shape comprising a substantially flat wedge-shaped section and a thin rib section perpendicular to said base section.

5. The conically-shaped screen basket of claim **1** further characterized in that the wedge-shaped rods have spacing means located at predetermined distances along their length, whereby the said rods can be spaced apart at a predetermined distance during assembly operations.

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2,907,465 10/1959 Heckmann et al. ----- 210—380

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JAMES L. DECESARE, Primary Examiner