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STACKABLE SIEVE CONSTRUCTION FOR USE IN RECIPROCATING AIR COLUMN SIFTERS AND THE LIKE

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Fig. 1

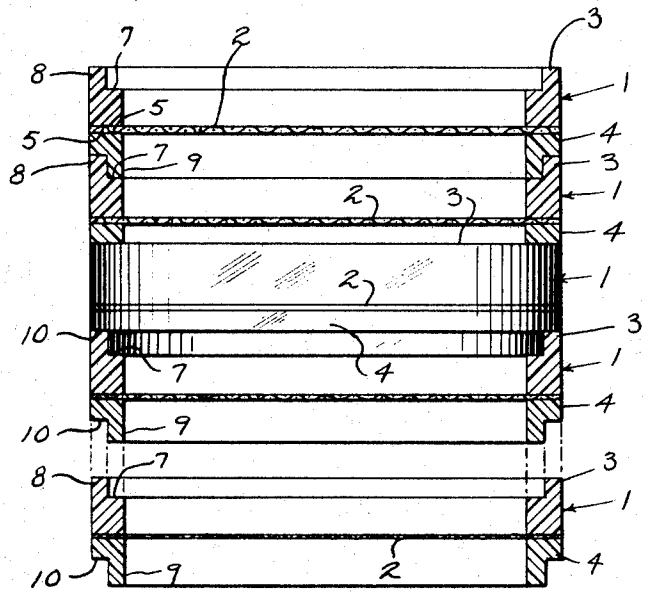


Fig. 2

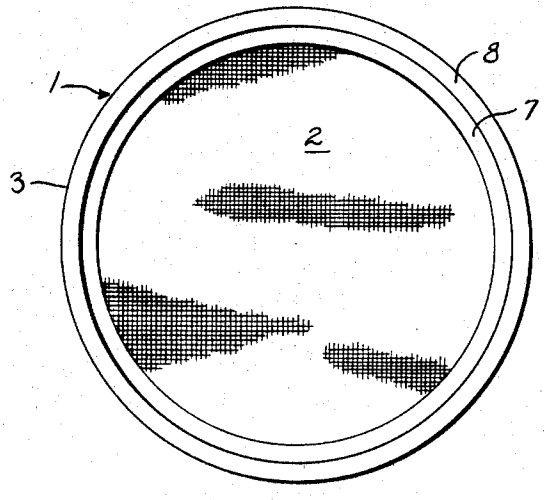
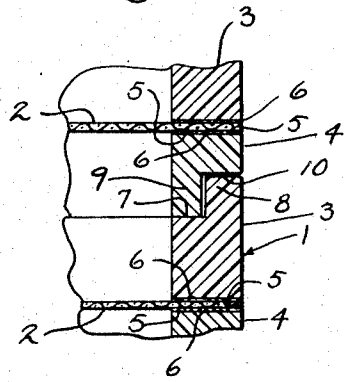


Fig. 3



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STACKABLE SIEVE CONSTRUCTION FOR USE IN RECIPROCATING AIR COLUMN SIFTERS AND THE LIKE

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ABSTRACT OF THE DISCLOSURE

A stackable sieve for a reciprocating air column sifter comprises a rigid ring member of substantial thickness which is formed of a transparent material. The ring member is split to define two aligned ring portions that have facing flat inner end surfaces of substantial width. The outer end of one portion is stepped to define an inner ledge and an outer rim and the outer end of the other portion is stepped to define an outer ledge and an inner rim. The outer and inner ledges and rims are all of approximately the same width, and the two rims are approximately of the same height so that two rings can be stacked one atop the other to define a tubular column with substantially continuous vertical walls. A screen is clamped between the two flat inner end surfaces, and extends outwardly to the outer circumference of the ring.

This invention relates to a stackable sieve construction especially suited for use in reciprocating air column sifters and the like.

A sifter of the type contemplated herein is shown in U.S. Patent No. 3,045,817 to C. W. Ward. In general, such sifters comprise a stack of sieves of different meshes arranged in serial order and providing an air column, and one or more conventional dynamic speakers which act as sonic vibrators to establish a reciprocating air movement to aid in sifting materials down through the sieves.

Heretofore, the sieves used in such sifters have been of the type comprising a rolled brass band having a screen soldered to its inner surface. The upper edge of the band is expanded slightly to receive the lower edge of another band with a friction fit so that two or more sieves can be stacked together.

Such sieves have not proven entirely satisfactory, especially for high accuracy applications such as in laboratory powder analysis. One major problem is that soldering the screens to the inner surfaces of the bands leaves solder deposits clogging the edges of the screens. In addition to reducing the effective areas of the screens, these deposits are in the air path and cause eddy currents. With the older type of sieve construction, the lower band edges also tend to jut out substantially into the air stream and create further flow disturbances. The net effect of the air flow disturbances is to seriously impair sifting efficiency, especially for very fine particles such as are found in face powders and the like. Such particles tend to be blown about in the sieve stack and to adhere to the sides of the sieves rather than sifting down through the stack. For laboratory work involving small samples and fine powders, even minor flow disturbances can significantly affect results.

Further, the rolled brass bands of older sieves easily get out of round which may result in spaces between

two stacked rings through which material may escape. A small laboratory sample may be lost entirely through such an opening.

Still further, the opaque bands of the older sieves prevent visual observation of the sifting operation, especially near the bottom of the stack where the finer screens are located. This makes it difficult to make the proper power adjustments, which may result in the use of too much power causing fine particles to be blown about the stack, or the use of too little power resulting in a loss of efficiency.

Because of the various problems, it has not heretofore been considered feasible to provide sieves of the older type in the very fine meshes required for laboratory analysis. The finest mesh commercially available in the older type sieves is No. 400, which provides openings of approximately 37 microns.

It is the general object of this invention to provide a stackable sieve construction in which a number of sieves can be stacked to provide an air column in which there are no deposits or projections to interfere with free air flow. Using the construction of this invention, it is possible to provide sieves with meshes as fine as 5 microns, as compared to the 37 micron meshes formerly available.

It is one specific object of this invention to provide a sieve with a split ring construction, in which a screen is held between two relatively thick ring parts, and extends outwardly to the outer surface of the assembled ring. This arrangement provides a maximum holding area for the screen, so that the finished sieve is strong enough to withstand prolonged use. Further, adhesive used to secure the ring parts together and hold the screen in place can be contained between the facing surfaces of the ring parts and will not extend out onto the screen to interfere with air flow.

It is another object of this invention to provide a construction in which the facing surfaces of two stacked sieves are stepped and meet along a right-angled offset path to minimize the possibility of material escaping between the sieves. In addition, this construction insures that two or more sieves will be accurately aligned when stacked to provide a sieve column having a relatively smooth inner surface free of projections which might interfere with air flow.

It is a further object of this invention to provide a sieve construction in which the ring member is transparent to allow visual observation of a sifting operation.

It is still another object of this invention to provide a sieve construction in which the ring member is formed of a rigid material that is easily machined to the required configuration and will hold its shape even after long use.

It is a still further object of this invention to provide a sieve having the foregoing advantages which is still relatively inexpensive and simple to manufacture and assemble.

Other objects and advantages will appear from the description to follow. In the description, reference is made to the accompanying drawing, forming a part hereof, in which there is shown, by way of illustration and not of limitation, a preferred embodiment of the invention.

In the drawing:

FIG. 1 is a view in elevation of a group of sieves formed according to this invention in a stacked arrangement, a number of the sieves being shown in cross-section and one being shown slightly removed from the rest,

FIG. 2 is a top plan view of one of the sieves shown in FIG. 1, and

FIG. 3 is an enlarged fragmentary view in cross-section showing the engagement between two stacked sieves.

FIG. 1 shows a stack of five sieves, each comprising a ring member 1 and a screen 2. All five sieves are substantially identical, but the meshes of the screens 2 are different. The sieves are arranged in serial order, the one with the largest or most open mesh being on top. It will readily be appreciated by those skilled in the art how a stack as shown could be incorporated in a sifter such as that disclosed in the aforementioned U.S. Patent No. 3,045,817, or for that matter in various other forms of sifters. A particularly satisfactory reciprocating air column sifter utilizing the sieves of this invention is shown in the copending application of Howard O. Suhm et al., Ser. No. 473,949 filed July 22, 1965.

The ring members 1 are formed of a rigid transparent material capable of being machined, preferably an acrylic plastic, and are of substantial thickness and height. For sieves having an inside diameter of three inches such as shown herein, the rings 1 are approximately one-fourth of an inch thick and have an overall height of about three-fourths of an inch.

Each ring 1 comprises two ring portions, an upper portion 3 and a lower portion 4. The portions 3 and 4 have aligned flat facing circular inner end surfaces 5 of substantial, constant width equal to the overall thickness of the ring 1, about one-fourth of an inch. The screen 2 is circular with a diameter equal to the outer diameter of the ring 1, the periphery of the screen 2 being held between the surfaces 5 and extending substantially to the outer circumference of the ring 1 to provide a maximum holding area.

The portions 3 and 4 of each ring 1 are held together by any suitable plastic adhesive 6 which, for the sake of clarity, is shown only in the enlarged view of FIG. 3. No substantial amount of adhesive 6 should extend inwardly beyond the inner circumference of the ring 1 to clog the exposed or working area of the screen 2. The relatively large holding area afforded by the wide surfaces 5 allows for the use of sufficient adhesive 6 to hold the portions 3 and 4 together while allowing for the adhesive 6 to be contained in the space between the surfaces 5. If desired, the portions 3 and 4 could be secured together by heat sealing, and the material of the portions 3 and 4 would then serve as an equivalent to the adhesive 6. Again, however, no substantial amount of the melted material should extend inwardly beyond the inner circumference of the ring 1.

In forming the sieves, it is preferable to provide a screen 2 that is larger than the ring 1 so that its outer edges can be clamped to hold it under tension during assembly. After assembly, the screen 2 can easily be trimmed to size.

The inner edge of the outer end of each upper ring portion 3 is cut away to define, at the top of the ring 1, a flat annular inner ledge 7 that extends about the inner circumference of the ring 1 and an upstanding, substantially rectangular outer annular rim 8 adjacent to the ledge 7 and extending about the outer circumference of the ring 1. The rim 8 and the ledge 7 are each of a width equal to approximately half the thickness of the ring 1.

The outer edge of the outer end of each lower portion 4 is cut away to define, at the bottom of the ring 1, a generally rectangular upstanding inner annular rim 9 that extends about the inner circumference of the ring 1 and a flat annular outer ledge 10 adjacent to the rim 9 that extends about the outer circumference of the ring 1. The rim 9 and ledge 10 are also of widths equal to approximately half the thickness of the ring 1.

When the sieves are stacked as shown in FIG. 1, the inner rim 9 of one rests on the inner ledge 7 of the sieve that is below, with the upper surface of the outer rim 8 of the lower sieve facing the outer ledge 10 and the inner or central side surfaces of the rims 8 and 9 facing one another. All of the facing surfaces are preferably frosted to provide for a more effective seal when the sieves are stacked.

The widths of the rims 8 and 9 and the ledges 7 and 10 are all approximately equal, and the heights of the rims 8 and 9 are approximately equal so that when two sieves are stacked they are in substantially exact alignment resulting, as can be seen in FIG. 1, in a column or stack with a relatively smooth inner surface having no projections extending inwardly to interfere with air flow.

In the preferred embodiment of the invention shown herein, the rims 8 and 9 are of widths slightly less than the widths of the ledges 7 and 10 and the rim 8 is of slightly less height than the rim 9. As a result, only the outer surfaces of the lower rims 9 and the ledges 7 of the several sieves actually meet when the sieves are stacked. There is a slight clearance, on the order of two or three thousandths of an inch, between the facing side surfaces of the rims 8 and 9 and between the outer surfaces of the rims 8 and the ledges 10. These slight clearances are provided to insure that the rims 9 will seat fully on the ledges 7 so as to seal off the air column along an annular band of substantial width, approximately half the thickness of the ring 1, about its inner surface. The very slight lateral play afforded by these clearances does not allow any substantial misalignment, and the stacked sieves will still provide a column with a relatively smooth inner surface.

The stepped construction of the sieve portions 3 and 4 results in any two sieves meeting along a right-angled offset path, which is important in preventing material from escaping between two sieves. That is, a particle must move horizontally between the rim 9 and ledge 7, turn a right angle and move upwardly and then turn another right angle and move horizontally between the ledge 10 and rim 8 before it can escape. This tortuous path makes it extremely difficult for material to escape between two sieves, even with the aforementioned slight clearances.

It should be noted that the rims 8 and 9 and ledges 7 and 10 may easily be formed by simple turning operations, so that the sieves are relatively simple and inexpensive to manufacture.

The transparency of the rings 1 makes visual observation of the sifting operation possible, even at the lowermost sieve of a stack. This enables the operator of a siffter to make proper power adjustments for the particular material being sifted and prevents the blowing about or lack of efficiency which might be caused by excessive or inadequate power.

Although a preferred embodiment of the invention has been shown and described herein, modifications and variations might be made without departure from the invention. It is not intended, therefore, that the invention be limited except insofar as limitations specifically appear in the following claims.

I claim:

1. A sieve adapted to be stacked with a plurality of like sieves to form a sieve stack assembly, said sieve comprising: a rigid ring member of substantial thickness that is of a split construction to define two aligned ring portions having flat facing inner end surfaces of substantial width, the outer end of one ring portion being stepped to define an inner ledge and an upstanding outer rim, the outer end of the other ring portion being stepped to define an upstanding inner rim and an outer ledge, the inner rim and inner ledge being of approximately the same width and the outer rim and outer ledge being of approximately the same width and the inner and outer rims being of approximately the same height; and a screen held between the facing inner end surfaces of the ring portions, the screen extending outwardly to the outer circumference of the ring about the entire circumference theref, said ring portions and said screen being united with one another by a bond between the inner end surfaces of the ring portions that penetrates

through the screen to thereby hold the screen securely in place.

2. A sieve according to claim 1 wherein the ring is formed of a transparent material.

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