April 16, 1940. E. H. NIEMEYER 2,197,435

SCREEN MOUNTING

Filed Feb. 8, 1937

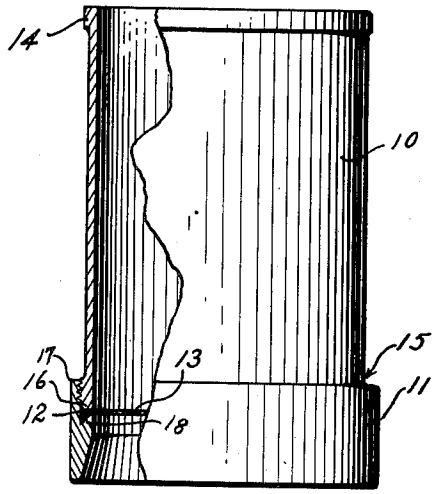


Fig. 1.

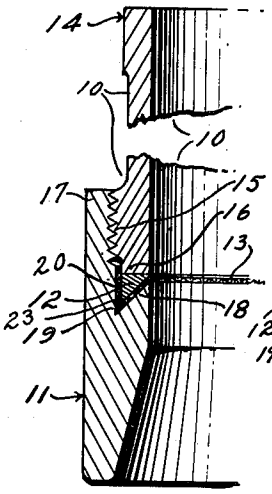


Fig. 2.

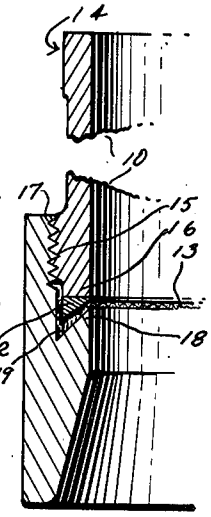


Fig. 6.

Fig. 7.

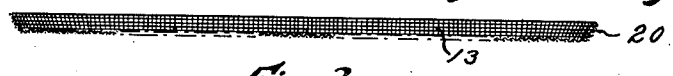
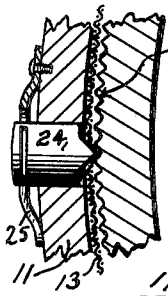


Fig. 3.



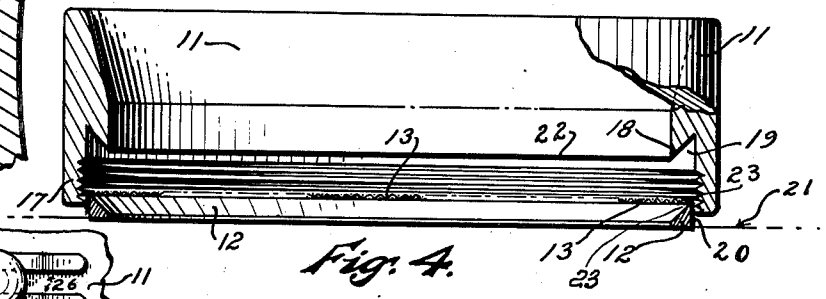


Fig. 4.

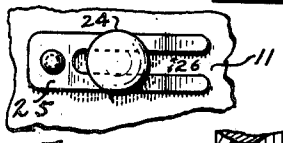


Fig. 8.



Fig. 9.

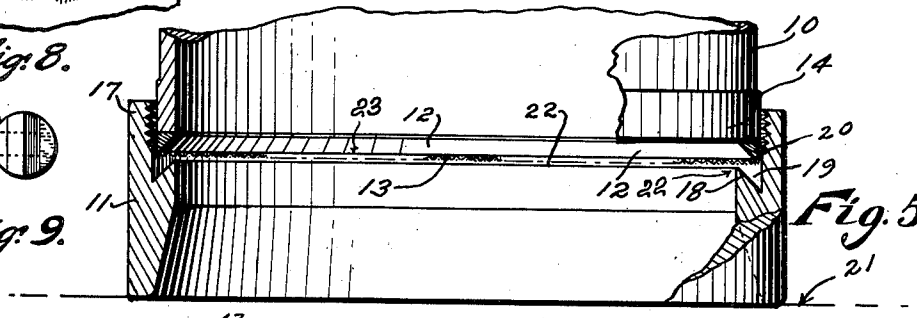


Fig. 5.

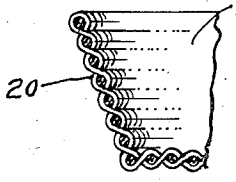


Fig. 10.

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SCREEN MOUNTING

Edward H. Niemeyer, Washington, D. C.

Application February 8, 1937, Serial No. 124,762

5 Claims. (Cl. 209—403)

The invention relates to sieves for classifying and separating solids; for fluid purification purposes, and especially such devices intended for use in scientific laboratories and arts where extreme exactness in the area or number of interstices in screens is required, and has for an object to reduce to a minimum the factors of errors in and use of such apparatus, especially in calculating the fineness of materials tested and the proportions of given quantities of materials which pass a screen under required conditions.

It is also an important aim of the invention to reduce the cost of laboratory equipment of the kind indicated. This is particularly important in the production of sieves of the greatest fineness such as are used in grading Portland cements, and in observations of the fluidity or movement of materials through screens under various conditions and under different limiting or augmenting conditions. Heretofore these sieves have been made with two partly telescoped mounting parts, the screen being stretched over one part and the other part engaged over the first so as to clamp the screen upon the inner one, solder being applied around the edge of the screen material so that by "sweating" it runs into the mesh of the screen between the two clamping members, and seals the joint between the two. This closes interstices of the screen at the periphery of the barrel and also in part penetrates the mesh within the mounting—that is, the passage through which the material being tested must pass. The last is highly objectionable because it reduces the effective area of the screen to less than the area within the mounting, which is to say less than the cross sectional measurement of the clear-way through the barrel mounting of the screen. This materially affects computations, particularly when they run into several significant figures, as is often the case. Thus in tests of cement a standard practice is to use a sample of a required weight and place it on a screen of from 200 to 300 mesh or finer, within a barrel mount of the general size shown in Figure 1 of the drawing herein, then subject it to a standard head of water for a given period of minutes, after which the residue and the filtrate are weighed to determine the rating of the sample according to a standard previously established, or to set up such standard.

A small sieve of the actual size shown in Figure 1 costs at the present time fifteen dollars or more, which is a material and onerous item of expense at the present value of the dollar.

In manufacture, each screen is usually calibrated for one or more specific uses, in terms appropriate to such use. In order to avoid excessive expense it is customary in manufacture of the old style screen to assemble the screen on the barrel with the base ring forced over the barrel and edge portion of the screen so as to hold the parts assembled, but without soldering. The screen is then calibrated by testing with materials of known fineness, and if found to fall within certain narrow limits of tolerance or error, it is then soldered. The soldering will vary the function of the screen, and as a consequence, a new calibration is required to give a true rating. By my invention a single calibration will suffice when the article is assembled, and if the screen is removed and returned to the mounting it will function the same as in its initial test.

By my construction and manner of use, simple screen or filter discs of the desired fineness or rating may be quickly put in place in a barrel mounting by simple manual operations enabling the replacement of worn or damaged screens with facility, and the repeated use of the barrel sections without deterioration and with increased effectiveness and accuracy of measurements made with the article. I enable a closer approach to an effective screen area the same as the cross sectional area of the barrel, so that exact calculations are rendered simpler, owing to the elimination of the factor of error in this direction, due to partial filling of the screen by solder within the barrel mounting.

In many tests made with such appliances it is important that the screen be accurately stretched in a perfect plane and supported so that it will not bulge or be deflected from its true plane. It is an important aim of the invention to attain such adjustment and support of screens by a novel structure and function and to enable the production of such means in an extremely compact form whereby objectionable weight and bulkiness of the equipment is avoided, and yet present a rugged and durable article which will not be easily damaged and will not deteriorate through wear objectionably. My invention is even less bulky and heavy than the prior equipment with soldered screens.

It is also an object of the invention to incorporate novel elements of construction by which accurate and rapid replacement of screens or filter elements is facilitated.

Additional objects, advantages and features of invention reside in the construction, arrangement and combination of parts involved in the embodiment of the invention, as will appear from

the following description and accompanying drawing, wherein

Figure 1 is a full size elevation, partly in section of one embodiment of my invention in a laboratory sieve.

Figure 2 is an enlarged detail of the screen and mounting in assembled relation.

Figure 3 is a section of the screen detached.

Figure 4 is a view showing one step in assembly of a screen with my mounting.

Figure 5 is a similar view of a further utilization of my invention in the assembly of the screen and mounting parts.

Figure 6 is a view similar to Figure 2 of a modification.

Figure 7 is a fragmentary section of a modified base ring and clamp.

Figure 8 is a fragmentary elevation showing the last named device.

Figure 9 is an elevation of the inner end of the clamp pin.

Figure 10 is a fragmentary enlarged section of the edge portion of the screen shown in Figure 3, taken on a radial plane of the screen.

There is illustrated a sieve which in its simplest form in Figures 1 to 5 consists of a barrel or receptacle body 10, a base ring or outer ring 11, an insert or clamping ring 12, and a screen or filter 13, the latter being of standard material now available on the open market. The barrel, base ring and clamping ring constitute the mounting for the screen.

The barrel comprises a section of stock drawn tubing exteriorly relieved through the major part of its length to lighten the article and to form a flat rib or lip 14 at the top to strengthen the edge of the barrel, as well as to serve a special function to be described. A raised or thickened part or shoulder 15 of slightly greater diameter than the rib 14 is also formed at the bottom end of the barrel. The thickened part 15 is extended a suitable distance longitudinally of the barrel and exteriorly threaded. The extremity of the barrel immediately beyond the threads is rabbeted or relieved to form a portion 16 of reduced diameter, for a special purpose to be explained. The end edge of the barrel, terminating the last named relieved part is finished with a smooth bearing face in a plane at right angles to the axis of the barrel.

The base ring 11 is interiorly threaded at its upper end 17 to screw onto the threads 15 on the barrel. A raised conical seat, face or shoulder 18 is formed on the interior of the base ring, and the interior diameter of the ring at the upper part is the same as that of the barrel interior. The surface of the shoulder presented toward the barrel thus inclines downwardly and outwardly, forming in effect an annular channel 19 next the longitudinally projecting end portion 17 of the base part 11 and adjacent the end of the barrel. The angular relation of the elements of this conical surface to the axis of the ring and barrel may be varied for purposes to be explained, but for certain types of screen the angle may be in the neighborhood of 40 degrees, more or less and their vertex is always toward the barrel. This angle is increased for finer screens—that is, the angle to the plane of the base of the seat or shoulder is reduced for delicate screens requiring least stretching. The inside diameter of the ring 11 at the upper inner edge of the shoulder 18 is the same as that of the barrel 10. The angular upper edge element 22 formed by the intersection of the conical surface and the inner face of the ring 11 is preferably not finished with a sharp edge, but is slightly dulled so as to avoid nicking a screen drawn thereover, as will be described. The lower inner surface of the ring 11 is relieved on the inner surface, forming an enlargement of the inner diameter toward the lower or discharge side of the ring, although the ring may be variously formed as requirements call for.

The insert ring 12 is formed with a cylindrical outer side of a diameter less than the inner diameter of the base ring to an extent corresponding to the thickness of the screen to be mounted. That is, when the screen is set across the ring 12 in the ring 11 with the edges of the screen smoothly turned up beside the ring 12, the screen will fit snugly against both rings and so be held against rotation and will be caused to hold its adjustment on the insert ring with a minimum liability of displacement. The lower side of the ring 12 is also formed with a conical face which may be parallel to the conical face 18, although it may be found preferable to give it a slightly lesser angle to the plane of the ring 12 and seat as shown in Figure 6, so that it will clamp an interposed screen more firmly at the inner edge of the conical face of the ring 12, and thus causing a more certain restriction of the interstices of the screen to their minimum at the wall of the barrel when the screen is fully secured. The difference in angle of the two conical faces should be slight in order to avoid development of tendency to cut the material of the screen, and in practice has been in the neighborhood of two degrees. It has been exaggerated in the drawing for the purpose of illustration. The material at the angle 23 formed by the intersection of the conical face of the ring 12 and its cylindrical side constitutes an edge element projected downwardly and spaced a material distance radially outward of the edge element 22.

The top face of the ring 12 is a smooth planiform bearing surface and at right angles to the axis of the ring and barrel, so that the lower end face of the barrel will support and press the ring 12 firmly toward, and in parallel relation to, the seat 18. The relieved part 16 of the barrel is preferably of less diameter than the external diameter of the ring 12, so that portions of a screen projecting upward above the ring 12 will be accommodated clear of the barrel end and without being deformed or otherwise operatively affected thereby.

The screen 13 may consist of a circular sheet of any suitable woven wire cloth or other fabric or foraminate material, but in the specific embodiment wire cloth is indicated, and my invention has been found especially valuable in the production of sieves with fine wire cloth (usually of bronze) mounted therein. The screen sheet is formed of a diameter sufficiently larger than that of the ring 12 to allow it to be turned up at its outer edge forming a flange 20 to lie snugly against the outer side of the ring 12 when the two are inserted in the base ring. Owing to the fact that the same diameter of wire is used for making screens of several different mesh ratings, one mounting as described will serve for different screens of different fineness containing the same size wire. For screens of wire of other thickness a ring 12 of external diameter appropriate to the respective wire gauge would be most effective although screens of different wire thicknesses may be mounted using the same ring 12 with good effect, though possibly less safety from wear

by rotating of the screen against the angular inner edge of the seat 18.

In practice, the barrel 10, the ring 11 and the ring 12 have all been made from a single tube stock, the differences in external diameter being effected by familiar lathe work, which insures great certainty in uniform inside diameter of the pieces adjacent the screen when assembled. The ring 12 is produced by first making the barrel with an extension of the relieved part 16 sufficient to afford material for the ring, forming the conical face at the extremity of this extension; then cutting off and finishing the cut off portion. Other methods of manufacture may be followed, however, as preferred.

In the use of the invention, I customarily preform the screen as shown in Figure 3 and supply these to customers for use in the standard mounting embodying my invention, with notation of the calibration effected by test of the screen in an original assembly in such a mounting. It will then ordinarily be unnecessary for the screen to be again calibrated by the purchaser when mounted in another of the standard mountings produced in accordance with my invention. The customer may, however, purchase a calibrated screen in the original mounting if desired, and for replacements may either purchase the screen and mount it himself, or may return his mounting to the manufacturer for emplacement and calibration therein of the desired screen. In either event, the renewal is greatly simplified and lowered in cost, as compared to prior practice in such equipment.

The preformed screen is circular, having a major planiform portion, the boundary of which is defined by the base of the flange 20, which is the integral edge portion of the screen bent upwardly to an oblique angle on a line which is a circle of the same diameter as that of the raised edge formed at the angle 23 on the ring 12. This oblique position of the flange facilitates introduction of the ring 12 within the flange of the screen and the certain positioning of the ring with the angle 23 accurately alined at the base of the flange, so that inaccurate positioning of the screen is minimized. The resilience of the screen material causes it to resume the form in Figure 2 when released from the mounting, where the flange is held at right angles to the planiform portion of the screen, and at an acute angle to the part between the raised edges 22 and 23.

For mounting a screen preformed as shown in Figure 3, the ring 12 may be laid on a surface 21, with the bevelled side upward, and the screen laid thereover with the flange 20 turned downwardly. Then, the ring 11 may be inverted thereover in alinement with the ring 12 and pressed down upon the screen so that the ring 12 and interposed screen enter the ring 11, as shown in Figure 4. The ring 11 is then lifted (the screen and ring 12 now being held frictionally therein) and set upon the surface 21, the barrel inverted and the end portion 14 pressed upon the ring 12 so that the latter is forced toward the seat 18, the portion 14 of the barrel entering the ring 11 freely with some clearance. The longitudinal dimension of the thickened part 14 is such that when the screen is pressed to initial engagement with the high portion of the seat 18, as in Figure 4, the portion 14 will be nearly flush with the top edge of the ring 11 and parallel thereto. In this way liability of pushing one side of the ring 12 too far and loosening the screen at two sides or flexing the ring 12 may be avoided by observing and keeping the upper edge of the part 14 nearly parallel to the top of the ring 11. After positioning of the screen in initial engagement with the raised edge 22 on the shoulder 18, the barrel end is withdrawn and the portion 15 of the barrel screwed into the ring 11 until the ring 12 is engaged by the barrel portion 16 and forced into proper clamping engagement with the screen edge. The article is then ready for use.

As the barrel is screwed into the ring 11, the edge of the screen being held firmly between the wall of the ring 11 and the insert ring 12, and being so held at the downwardly projected outer edge 23 of the ring 12 close beside the outer wall of the ring 11, if sufficiently slack, the screen will be stretched and tautened to approximately the extent of twice the difference between the length of the conical elements of the shoulder 18 and the radial depth of the shoulder. But if the screen becomes properly taut on any diametrical line before this extent of take-up, further movement of the ring 12 toward clamping position will result in slippage of the screen material adjacent this line between the ring 12 and the ring 17 around the angle 23. This results in a uniform stretching of the whole area of the screen within the ring 12 to a taut condition, without distortion or disturbance of the mesh count of the fabric. It should be appreciated that the screen is not actually stretched by elongation of the wire therein in this operation, but that the actual effect is to simply place the screen in a good planiform condition, and the principal effect in the drawing action at the edge 23 is to cause a more snug adjustment of the screen upon the edge 22 and around the edge 23 with a straightening of the material into a more nearly coniform shape between the edges 22 and 23 until the material between these angles is actually clamped and firmly held between wide bearing faces of the seat 18 and ring 12 pressing against the screen.

In case there is found a tendency of the screen to rotate on the edge 22 of the seat 18 in the final tightening movement of the barrel 10 in the ring 11, means may be provided to positively hold or lock the screen against such movement. One example of such means is shown in Figures 7 and 8, wherein the ring is provided with a peripheral knurling or milling as at 12', and a spring-released pin 24 is mounted radially slidable through the wall of the ring 11. The pin is nicked at its outer end on two sides and a small bow spring 25 bifurcated at one end has the neck of the pin set in the slot 26 thereof, the spring being bowed outward so that it holds the pin at the outer limits of its movement. One end of the spring may be secured to the ring 11. This prevents turning of the pin.

With this last described device, before the barrel is fully screwed into the ring 11, and preferably after the screen is initially positioned against the seat 18 as in Figure 4, the finger of the manipulator is pressed upon the pin 24, locking the screen against rotation while the final turns of the barrel in the ring 11 are imparted. By forming one or more points or serrations on the inner end of the pin the screen will be securely held against rotation, and the ring 12 also caused to be held by its knurling so that it will not turn within the screen.

It will be seen that cleaning of the screen is greatly facilitated by my invention, as well as replacements, and other advantages attained contributing greatly to the effectiveness of such

equipment as well as reducing costs of laboratory maintenance.

In the following claims, the term "screen" will be understood to include various strainer and filter elements, and various changes in the embodiment of the invention from that specifically illustrated may be made without departing from the spirit of the invention except as set forth in the claims.

As may be understood the degree of screen tension may be varied in any of the embodiments of the invention by varying the angle of the conical surfaces to the plane of the screen, and especially the angle of the shoulder or seat 18.

A replacement screen preformed for my device, of 300 mesh wire cloth may be secured at retail for about two dollars and a half, with the cloth selling at wholesale for about twenty dollars per square foot, at the present time.

I claim:

1. A device of the character described comprising two tubular bodies one engaged partly over the other having respective interlocking parts rotatively coengaged to secure them in engaged position releasably, the first having a shoulder spaced longitudinally inwardly of the engaged end formed with a conical seat, the vertex of the elements thereof being in the direction of the second body, said seat extending to the inner face of the body, the second body having a bearing end alined longitudinally with the shoulder, an insert clamp ring having a bearing face next to the end of the second body, the end of the second body engaging the last named bearing face, a conical face on said ring opposed to the said seat and extending to the inner and outer perimetral sides of the ring and the vertex of its elements being in the same direction as the first named vertex, the interior diameter of the ring being the same as that of the said first body, said conical face being shaped to tightly clamp an interposed screen against the seat at a line at the inner face of the first body, said ring being of an external radius less than that of the interior of the said engaged end of the first body beyond said seat to a degree corresponding to the thickness of the screen hereinafter named, and a planiform screen sheet set between the ring and said seat having its peripheral edge portion extended longitudinally outward in the first body beside and circumscribing said ring and pinched slidably between the peripheral face of the ring and the outer part of the said first body longitudinally beyond the said seat, said outer part of the first body being substantially continuous perimetrally.

2. The structure of claim 1 in which the angle of the elements of the first named conical seat to the plane of the base of the shoulder is greater than the corresponding angle of the elements of the conical face of the insert ring.

3. The structure of claim 1 in which said interlocking parts are integral with the respective bodies and a locking member is mounted in the side of the first body movable to engage the screen beside the insert ring and normally tending to lie in disengaged position, and having an exposed finger piece yieldable to digital pressure to engage the screen.

4. The structure of claim 1 in which said interlocking parts are integral with the respective bodies and said insert ring is knurled, and a locking member is mounted in the side of the first body movable to engage the screen beside the insert ring and normally tending to lie in disengaged position, and having an exposed finger piece yieldable to digital pressure to engage the screen.

5. A laboratory sieve of the character described, consisting of a lower cylindrical screen clamping member having an upwardly projected inwardly located annular edge element and having a vertical wall spaced outwardly thereof and extending a substantial distance above the edge element, an upper cylindrical clamping member movable longitudinally in the first member and having a diameter sufficiently less than that of the said wall to receive between said wall and upper member frictionally the edge portion of a screen and having a downwardly projected annular edge element spaced a material distance radially outwardly of the said upwardly projected edge element, a screen set between the two members and having an edge portion extended upwardly in frictional coengagement between the said wall and said upper member, whereby to be initially held frictionally therebetween and across the said downwardly projected edge element while out of operative engagement with the said upwardly projected edge element, said members being constructed and adapted to clamp the screen in final position of the members, and means to press said members toward each other and together upon the screen and to hold them in coengagement therewith, whereby the screen will be drawn across the said upwardly projected edge element while free thereover and while free between said edge elements, and may swing with a conical form of progressively increased altitude to a final taut condition as the said members are pressed toward each other.

EDWARD H. NIEMEYER.