Nov. 22, 1966 N. J. BOHR 3,286,338

METHOD FOR TENSIONING SIEVES

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FIG. 1

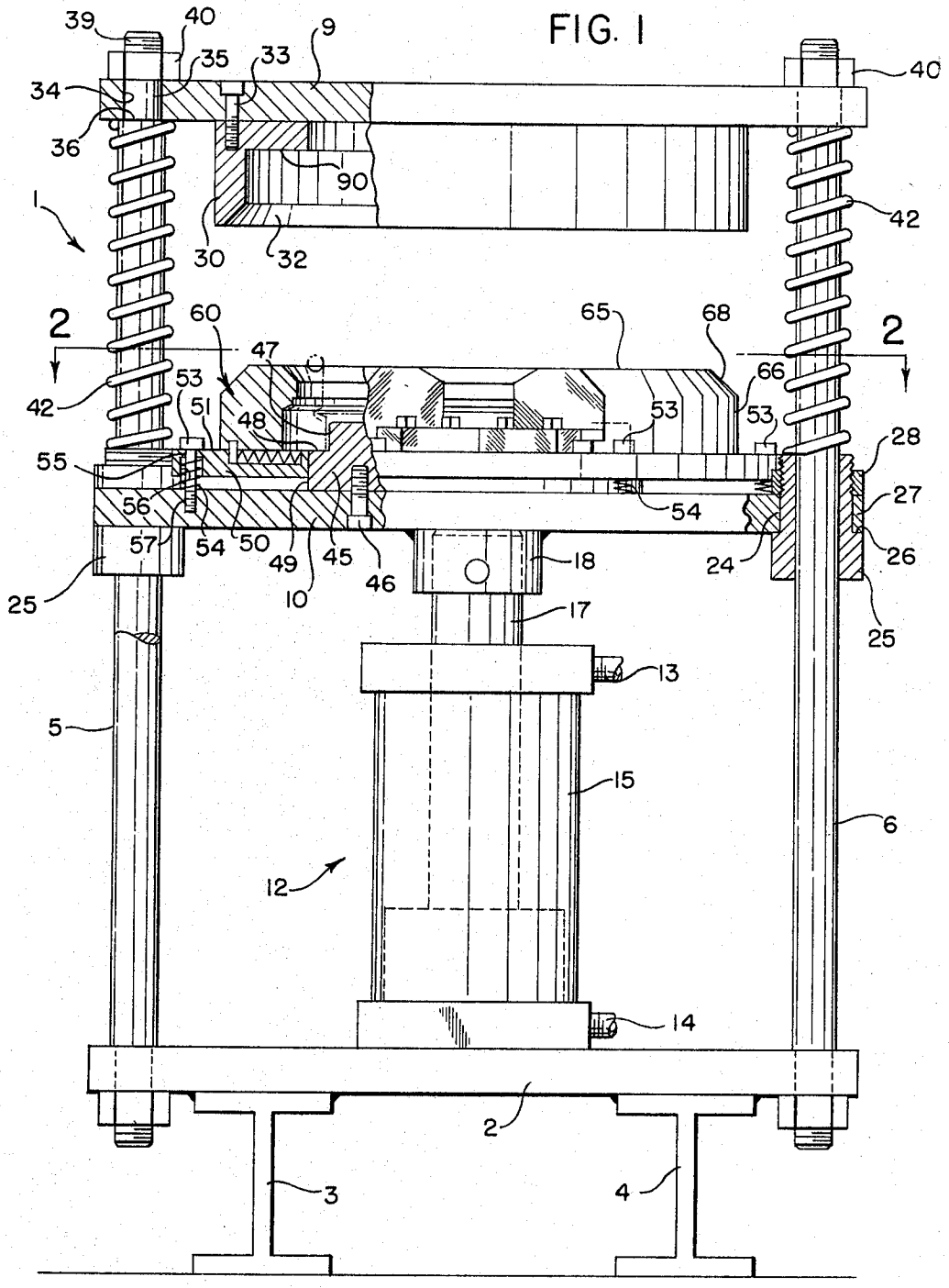

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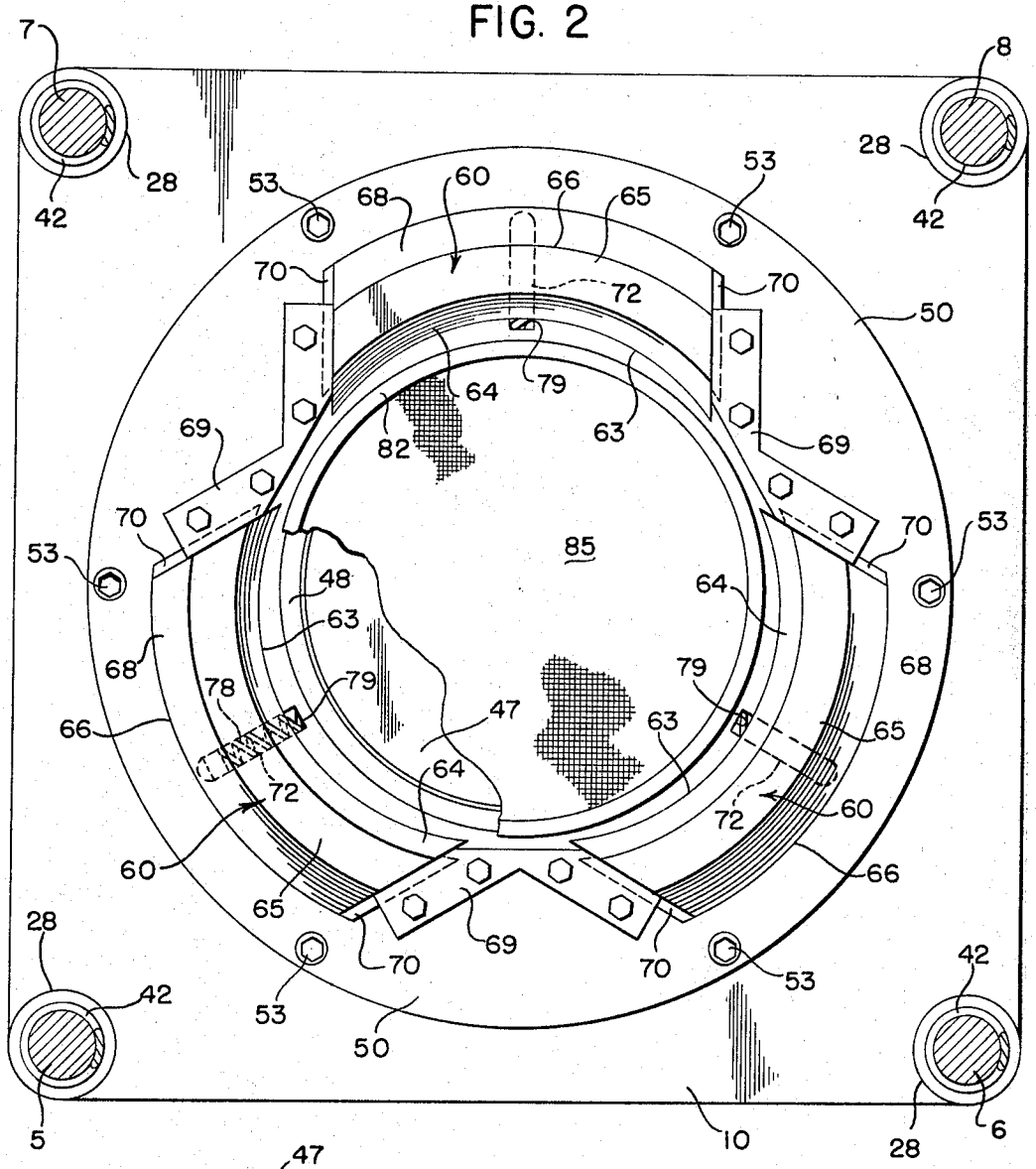
FIG. 2



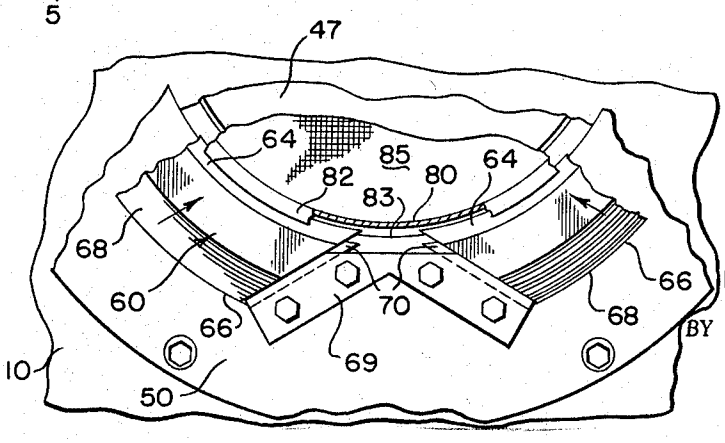


FIG. 3

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FIG. 5

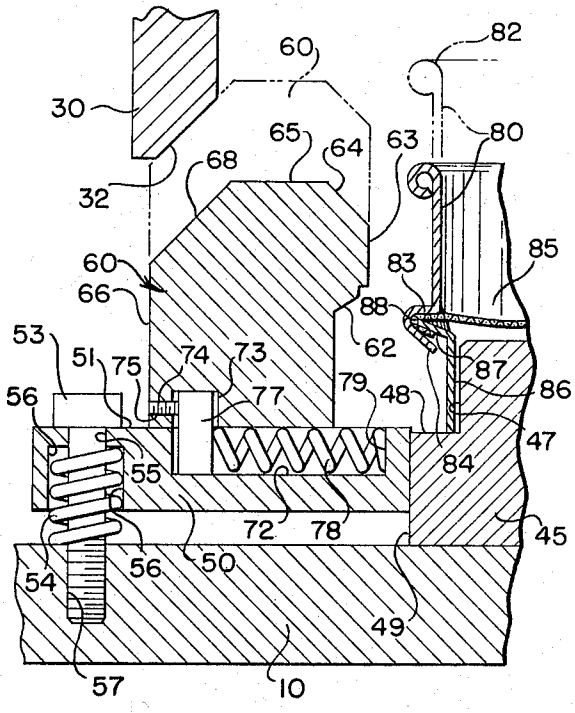


FIG. 4

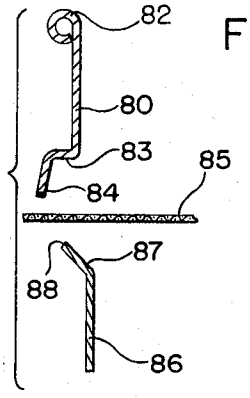


FIG. 6

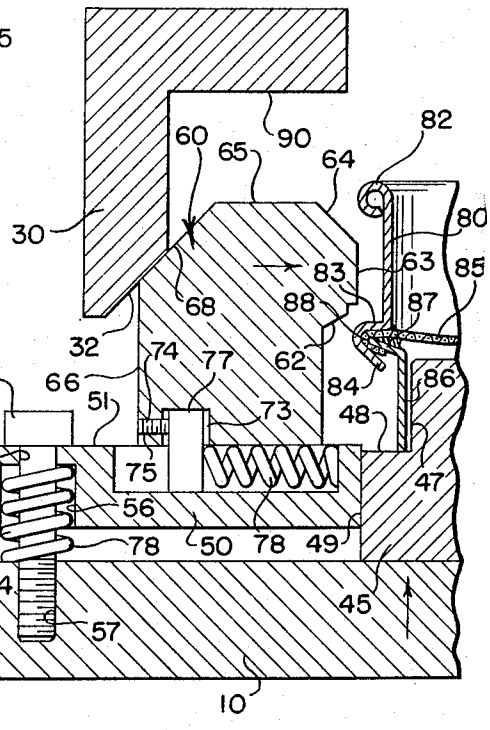
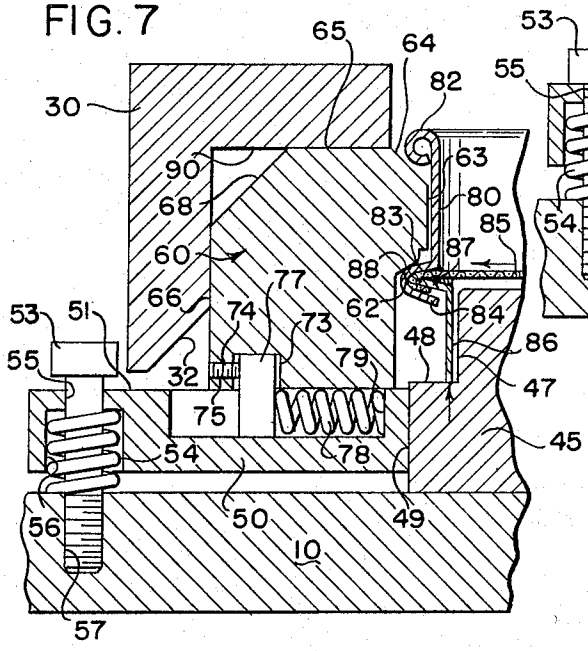


FIG. 7



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METHOD FOR TENSIONING SIEVES

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3 Claims. (Cl. 29—446)

This invention concerns a novel method for tensioning presoldered woven wire cloth sieves such as covered by the approved standards of the American Standards Association A.S.A. No. Z23.1–1958, the American Association State Highway Official Standard A.A.S.H.O. No. M92–42 and the American Society for Testing Materials designation E11–61.

The presoldered woven wire cloth sieves to be tensioned by the method of this invention are typically constructed from wire cloth of brass, bronze, or other suitable wire which is not coated or plated. The average opening between the adjacent warp and the adjacent shoot wires is closely controlled within permissible variations according to the standard specifications which will in general vary from the average opening plus or minus 2 to 7 percent depending upon the sieve size and the wire diameter.

The method of the present invention has been specifically devised to provide efficient tensioning of presoldered woven wire cloth sieves so that undesirable opening distortion, looseness and waviness in the cloth may be positively minimized during mass production of the sieves.

The woven wire cloth sieves to be tensioned by the method of the instant invention have the wire cloth soldered to the frame by means of a smoothly filled joint or fillet which prevents the material being sieved from catching in the joint between the cloth and the frame. The frames are generally annular and of brass and contain a lower annular skirt portion which holds the cloth to the upper member or frame by means of the soldered joint therebetween.

The problem in the art of looseness, waviness and distortion of the wire cloth openings has been the natural result of the initial assemblying of the upper frame and the wire with the lower sieve skirt member. This results from the fact that during the assembly and bonding or soldering operation, it is impossible to obtain uniform tension throughout the surface of the wire cloth.

In one prior art procedure for tensioning presoldered woven wire cloth sieves, the skirt is placed over a mandrel and the flange is tapped with a wooden mallet at a plurality of arbitrarily selected points around the periphery. This has resulted in poor quality control of the sieves and has required skilled labor in order to produce sieves which comply with the standard specifications.

Accordingly, it will be understood that the present invention relates to the final tensioning of the woven wire cloth by means of a novel method specifically designed to produce an accurate and quality sieve of uniform wire cloth tension.

Broadly, the method of tensioning the presoldered woven wire cloth sieve comprises providing a preassembled sieve structure having an upper annular frame with outwardly and downwardly turned flange portions on its lower margin and a concentric lower annular skirt having an outwardly and upwardly angled flange portion on its upper margin nested in the angle formed by the flange portions of the upper frame with an annular piece of wire cloth held therebetween by means of a filleted solder joint. The thus preassembled and presoldered woven wire cloth sieve structure is then tensioned by simultaneously exerting a downwardly and radially inwardly directed force about substantially all of the periphery of the flange of the upper frame uniformly to increase the tension on the cloth.

In its more specific aspects, the method contemplates the use of the step of inserting the lower skirt of the preassembled structure on a mandrel prior to the step of exerting the tensioning force.

The apparatus for performing the novel method of tensioning the presoldered woven wire cloth sieves includes dies segments which have downwardly and inwardly facing angular metal forming surfaces. These die segments are mounted upon a guide plate for radial movement. Means are provided for moving the guide plate in a vertical path such that the die segments come into engagement with fixed cam means located above them upon upward movement of the guide plate. The engagement of the die segments with the fixed cam means causes radial inward movement of the die segments in a radial direction upon the guide plate. A mandrel means is mounted within an open central portion of the guide plate such that the presoldered flanged wire cloth sieve may be placed on the mandrel means. Thus, when the guide plate is moved upwardly to engage the segments with the fixed cam means, the radially inwardly moving segments come into engagement with the sieve flange only to deform the flange downwardly about the periphery of the sieve. This action uniformly tensions the presoldered woven wire cloth to provide a sieve structure having a minimum of opening distortion, looseness and waviness.

With the brief description of the invention and the problems of the prior art in mind, it is an object of the invention to provide an improved method of tensioning presoldered woven wire cloth sieves by simultaneously exerting a downwardly and radially directed inward force about substantially all of the periphery of the upper flange to tension uniformly the wire cloth to provide a sieve structure having a minimum of opening distortion, looseness and waviness.

Other and more specific objects of the invention will be apparent from the detailed description to follow.

In the drawings:

FIG. 1 illustrates an elevational view with portions broken away for clarity of one embodiment of the apparatus for tensioning presoldered woven wire cloth sieves according to the invention.

FIG. 2 is a cross sectional view of the apparatus along the line 2—2 of FIG. 1.

FIG. 3 is an enlarged view similar to FIG. 2 of a fragmentary portion of the apparatus.

FIG. 4 is an exploded view of the components of a woven wire cloth sieve of the type to be tensioned by the method of the instant application.

FIG. 5 is a schematic cross sectional elevational view illustrating a portion of the support frame and components of the apparatus of FIG. 1 with a presoldered woven wire sieve mounted thereon.

FIG 6 is a view similar to FIG. 5 during radial movement of the die segments.

FIG. 7 is a view similar to FIGS. 5 and 6 illustrating the relative location of certain of the elements and the sieve at the completion of the tensioning of the woven wire cloth.

FIG. 1 illustrates an apparatus for tensioning presoldered woven wire cloth sieves in which a support frame 1 has a fixed base plate 2 mounted on suitable structural members 3 and 4. The fixed base plate 2 is generally square or rectangular in shape and has in the marginal areas adjacent its corners four upstanding vertical post members 5, 6, 7 and 8. These post members together with a fixed top plate 9 and a moveably mounted intermediate base plate 10 are supported on the posts 5, 6, 7 and 8 to make up the complete support frame 1.

Mounted on the fixed base plate 2 and controlling the vertical position of the base plate 10 is a hydraulic element generally designated by the numeral 12 having appropriate

inlet 13 and outlet 14 which lead to a suitable manual hydraulic pump or other source of controlled hydraulic pressure (not shown) of a type well known in the art. The hydraulic actuating device has an outer cylindrical casing 15 and a piston 17 having an exposed end. The piston 17 is actuated by the variations of hydraulic pressure within the cylindrical casing 15. A collar 18 is welded or otherwise suitably secured to the bottom of the base plate 10 such that the upper end of the exposed portion of the piston 17 of the hydraulic device 12 may be seated therein for force transmission to the base plate 10.

The base plate 10 is moveably mounted on the posts 5, 6, 7 and 8 by means of apertures, such as aperture 24 in register concentrically with the four vertical posts.

Within the aperture 24 of the base plate 10 is a bushing member 25 having a flange 26 which supports the marginal area 27 of the base plate 10 and maintains the proper alignment of the plate 10 during movement along the vertical support posts of the frame 1. The upper end of the bushing 25 extends above the base plate 10 and is externally threaded to receive a suitable nut 28 to hold the bushing in place with the base 10.

Identical structure is found at each of the four corners of the base plate 10 to provide smooth bearing surfaces for the base 10 on the vertical posts during its movement upwardly or downwardly in response to the hydraulic cylinder or actuating mechanism 12.

The fixed top plate 9 has attached thereto, above the base plate 10 on the lower side of the fixed top plate 9, a generally cylindrical fixed cam member 30 having an inwardly and upwardly angled camming surface 32 thereon. The fixed camming member is attached to the fixed top plate by means of suitable countersunk bolts 33 being threadedly engaged therewith. The fixed top plate 9 is held in position on posts 5, 6, 7 and 8 by means of bores such as the bore 34 through which the reduced diameter extension 35 at the uppermost end of the post 5 passes. The reduced diameter portion 35 of the post 5 provides a shoulder 36 upon which the fixed top plate 9 is seated. Suitable threads 39 are provided on the end of the fixed post 5 such that a nut 40 may secure the fixed top plate 9 tightly against a shoulder 36.

Mounted between the face of the fixed top plate 9 and the uppermost surface of the collar 25 is a spring 42 which normally urges the base plate 10 and the piston 17 downwardly away from the fixed camming member 30. The structure at each of the corners 9 is similar to that described with respect to the structure adjacent the fixed vertical post 5 such that the vertical posts 6, 7 and 8 support the other corners of the fixed top plate 9 in the same manner.

Coaxially aligned with the cylindrical fixed camming member 30 mounted on the top surface of the moveable base plate 10 is a mandrel means 45. Suitable means such as bolts 46 are provided to secure the mandrel means to the base plate 10. The mandrel 45 has a reduced cylindrical portion 47 at its uppermost end which provides an annular shoulder 48 thereon which terminates at its outermost end in the lower outer cylindrical wall 49 of the mandrel 45.

An annular guide plate 50 is provided about the periphery of the mandrel surface 49 but is of somewhat less thickness than the cylindrical height of the surface 47 such that it may be spaced from the top surface of the base plate 10. Accordingly, the annular guide plate 50 may be spaced from the base plate 10 while the top surface 51 of the guide plate 50 is flush with the shoulder 48 of the mandrel. The guide plate 50 is maintained in this position by means of a series of bolts 53 having springs 54 mounted on the shanks thereof between the plates 10 and 50. The bolts 53 pass through suitable counterbored openings 55 in the guide plate such that the downwardly opening counterbores 56 receive the upper end of the springs 54. The bolts 53 are threadedly secured in suitable holes 57 in the upper surface of the base plate 10.

As illustrated in FIG. 2, for instance, a plurality of die segments 60 are provided about the periphery and spaced from the periphery of the mandrel 45. As illustrated, three dies are used although it should be understood that any number of dies may be used if so desired.

As seen in FIGS. 5–7, the die segments 60 have a workpiece flange forming surface 62 which is angled radially inwardly and upwardly with respect to the base plate 10. The segments taken together in their deforming position define a substantially annular face 63 which is bevelled as at 64 between the front face 63 and a top annular surface 65 formed by the segments. Between the outer annular surface 66 of the segments and the top surface 65 is the bevelled cam engaging surface 68 which is in spaced opposing relationship to the camming surface 32 of the fixed die 30 and directly below the same before the actuation of the hydraulic mechanism 12.

The die segments 60 are mounted between angular slide members 69 which have an undercut portion for co-operation with a laterally depending flange 70 on the die segments 60 to retain the die segments against vertical movement independent of the guide plate 50. Also within the top surface of the guide plate 50 radially spaced by an amount equal to $n/360°$, where n is the number of die segments, are radial channels 72. Extending from a seat 73 in the die segments 60 and held therein by means of set screws 74 threadedly associated with the outer surface 66 by bores 75 in the outer surface of the die segments 60 are guide keys 77. As shown in FIG. 5, each key 77 is dimensioned so as to extend downwardly to the base of its respective guide slot 72 in the guide plate 50. The key 77, as shown, is freely longitudinally slideable along said guide slot in a radial direction against the bias of a spring 78 disposed in the radial guide slot 72 in abutting relationship with the guide key 77 and the radially innermost end 79 of the slot 72.

The woven wire cloth sieve to be tensioned according to the principles of this invention, on the illustrated apparatus is initially formed from an upper frame member 80 as shown in FIG. 4. The frame 80 has a substantially vertical annular wall with an outwardly turned bead 82 at its uppermost marginal edge and a generally horizontally outwardly extending flange portion 83 which terminates in a generally downwardly and radially outwardly extending flange portion 84. A woven wire cloth blank 85 of generally circular shape is provided having sufficient radius to extend slightly beyond the endmost flange portion 84 of the annular upper frame 80. The cloth 85 in the assembled sieve is held in the angle formed by the flange portion 83 and the flange portion 84 by means of a lower annular skirt 86 having an outwardly and upwardly turned flange portion 87 which has its upper end 88 of a diameter slightly less than the diameter of the circle defined by the apex of the angle between the portions 83 and 84. The cloth 85 is clamped and held around the edge 88 by a radially inward deformation of the flange portion 84 under the lower skirt flange 87. The integrity of this arrangement is then maintained by a soldering operation and the sieve is then in the condition illustrated in FIGURES 5 and 6, ready to be tensioned.

The tensioning method as performed on the illustrated apparatus is set forth in FIGURES 5, 6 and 7.

Initially, the presoldered woven wire cloth sieve is placed on the mandrel 45 with the lower annular skirt 86 surrounding the reduced portion of the mandrel 47 and resting on the shoulder 48.

Upon actuation of the hydraulic mechanism 12, the piston 17 acts to move the base plate 10 and the die segments thereon upwardly until they assume a position with the surface 68 in engagement with the fixed camming surface 32 as shown in dotted lines in FIGURE 5. It will be seen that the springs 54 are of sufficient strength to maintain the maximum separation between the plates 10 and 50 as they continue their vertical movement as seen in FIGURE 6, with the surfaces 68 and 32 acting to

radially inwardly cam the die segments **60** against the outwardly biasing force of the spring **72** until the forming surface **62** comes in register with the outside of the angled portion of the upper frame **80** at a position slightly above the flange portions **83** and **84**.

At this point in the radial movement of the die segments **60** the surface **68** of the segments clears the radially inwardmost point of the fixed camming surface **32** and the die segments and movable structure including the workpiece mounted on the mandrel shoulder **48** continue their vertical upward movement until the top surface **65** of the die segments engage the lower inner surface **90** of the fixed cam means **30**. Almost simultaneously with this occurrence the forming surface **62** of the segments engages the outside of the angled portion of the upper frame **80**. The hydraulic piston **17** continuing upward to drive the plate **10** with the die segments **60** and the guide plate **50** being positively stopped by the surface **90** of the fixed structure, relative movement occurs between the base plate **10** and mandrel **45** in the die segments **60** for the first time in a vertical direction. This vertical movement is translated through the forming surface **62** to the bead formed by the sieve flange portions such that the lower flange portion **84** is curled further under the flange portion **88** of the skirt while the flange portion **83** is driven down even further out of its initial substantially horizontal orientation.

In effect then, the wire cloth is further tensioned because it is drawn radially and downwardly a great distance throughout substantially all of its 360° periphery. During this relative movement the reaction force to the forming force exerted by the forming surface **62** is supplied by the mandrel shoulder **48** while the spring **54** insures that the full effect of the hydraulic forces of the actuator **12** are not transmitted to the sieve structure in a manner which would damage it.

Moreover, it will be noticed that there is no positive radial clamping of the workpiece which would damage its polished brass finish.

Accordingly, it will be seen that an efficient method for tensioning presoldered woven wire screen cloth has been provided by the instant invention.

For ease of description the principles of the invention have been set forth in connection with but a single illustrated embodiment. It is not my intention that the illustrated embodiment nor the terminology employed in describing it be limiting inasmuch as variations in these may be made without departing from the spirit of the invention. Rather, I desire to be restricted only by the scope of the appended claims.

I claim:

1. A method of tensioning presoldered woven wire cloth sieves comprising:

providing a preassembled sieve structure having an upper annular frame with outwardly and downwardly turned flange portions on its lower margin and a concentric lower annular skirt having an outwardly and upwardly angled flange portion on its upper margin nested in the angle formed by the flange portions of said upper frame with an annular piece of wire cloth held therebetween by means of filleted solder,

simultaneously exerting a downwardly and radially directed inward force about substantially all of the periphery of the flange of the upper frame uniformly to deform said angled flange on said lower skirt downwardly and radially outwardly and said turned flange on said upper annular frame downwardly and radially inwardly about the edge of said radially outwardly deformed flange on said skirt to thereby increase the tension on said cloth.

2. The method of claim **1** which includes the step of inserting the lower skirt of the preassembled sieve structure on a mandrel prior to the step of exerting a force.

3. The method of claim **1** in which prior to the step of simultaneously exerting a downwardly and radially directed inward force, the step of placing the lower edge of the lower skirt against a shoulder of the lower end of the sieve holding mandrel is included.

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