

July 13, 1965

G. TAEGE

3,194,397

ADJUSTABLE SIEVES

Filed May 24, 1962

4 Sheets-Sheet 1

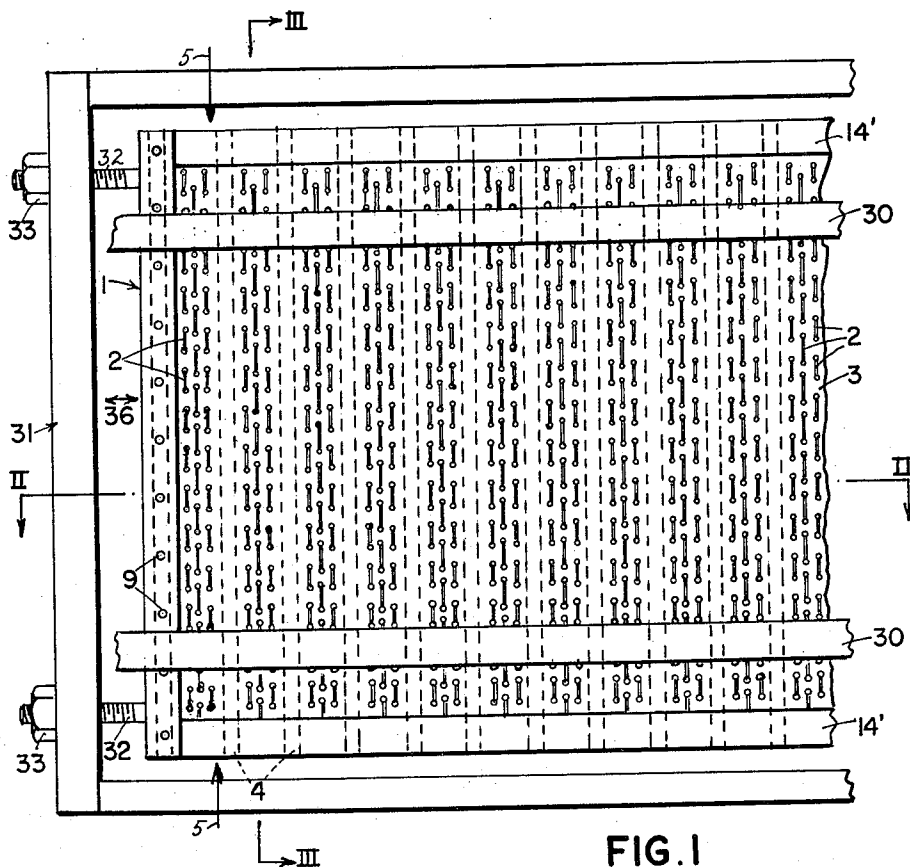


FIG. 1

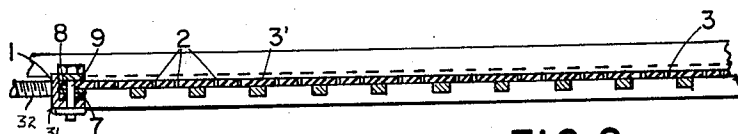


FIG. 2

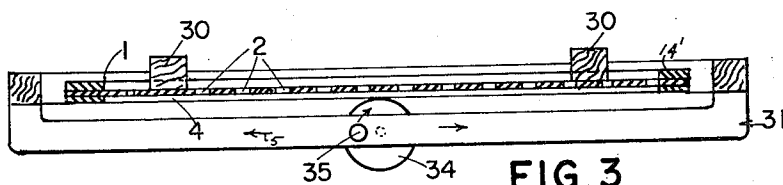


FIG. 3

Günter Taege
INVENTOR.

BY

Karl F. Ross

AGENT.

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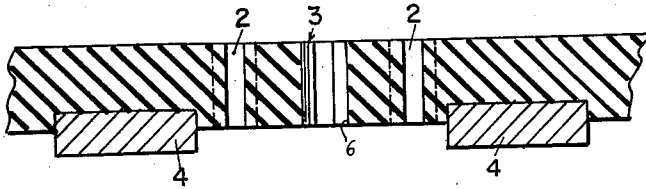


FIG. 4

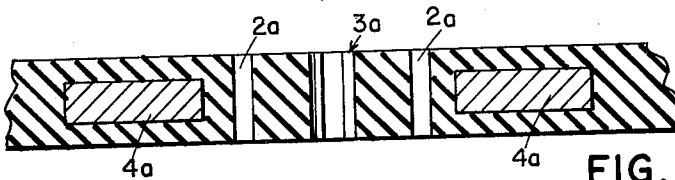


FIG. 5

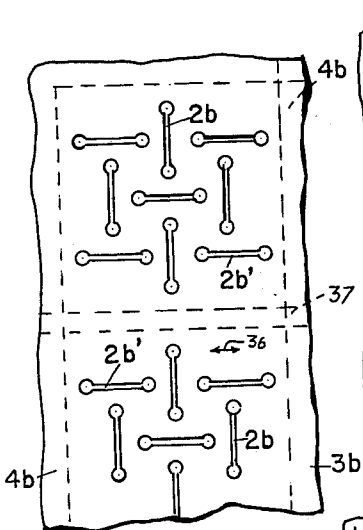


FIG. 6A

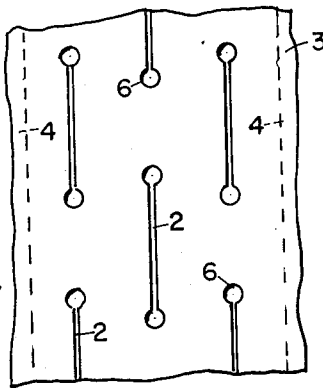


FIG. 6

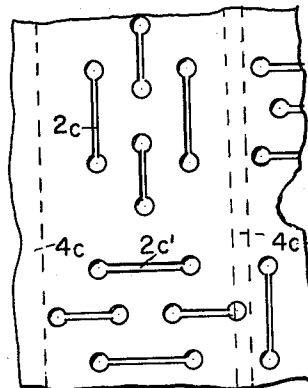


FIG. 6B

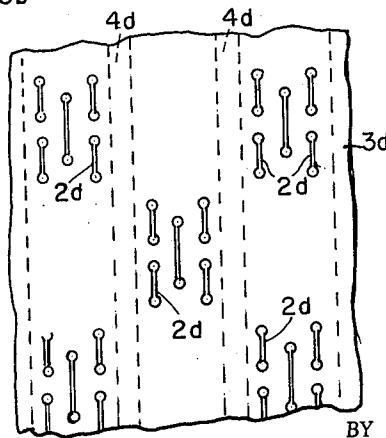


FIG. 6C

Günter Taege
INVENTOR.

Karl F. Ross
BY

AGENT.

July 13, 1965

G. TAEGE

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FIG. 7

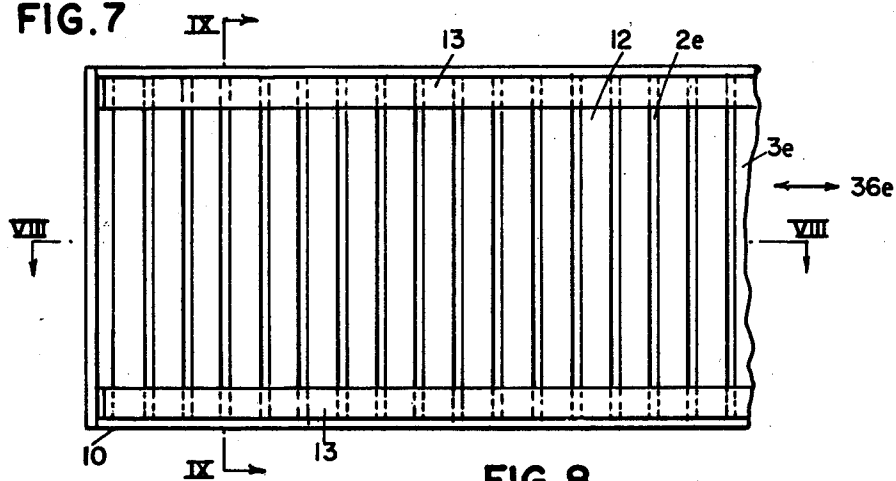


FIG. 8

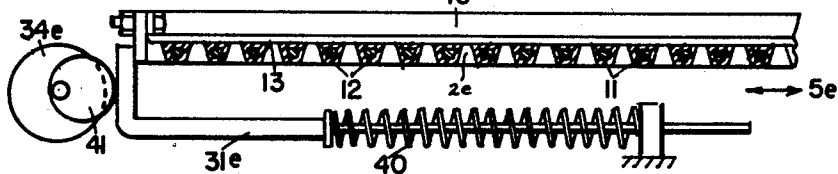


FIG. 9

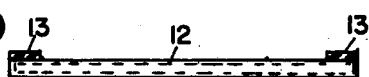


FIG. 10

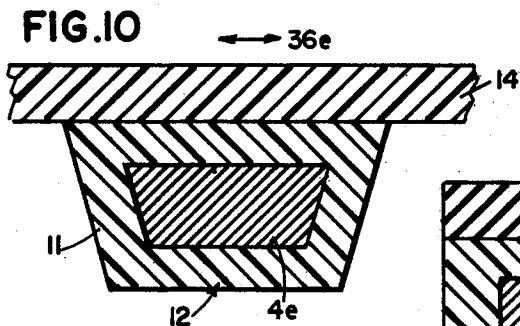
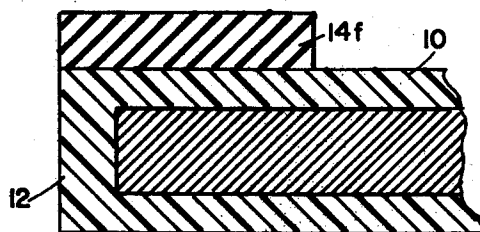


FIG. 11



Günter Toege
INVENTOR

BY

Karl F. Ross
AGENT.

July 13, 1965

G. TAEGE

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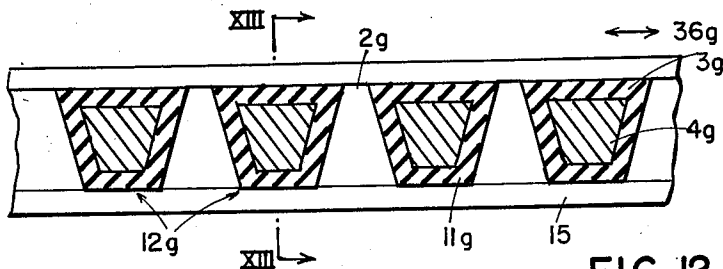


FIG. 12



FIG. 13

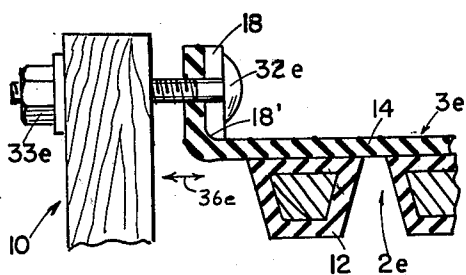


FIG. 14

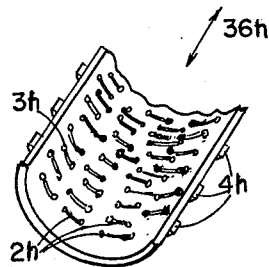


FIG. 16

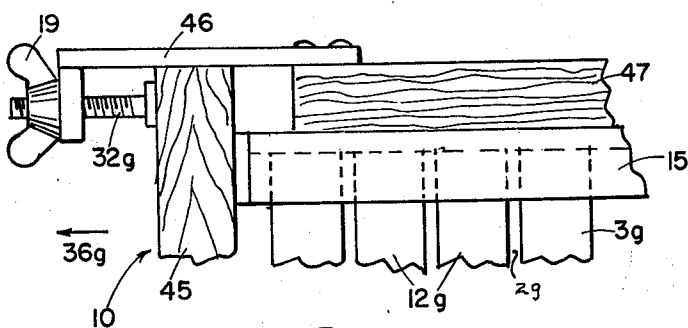


FIG. 15

Günter Taege
INVENTOR.

BY

Karl F. Ross
AGENT.

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ADJUSTABLE SIEVES

Günter Taege, Mulheim (Ruhr), Germany, assignor to H. G. Schauenburg Verwaltung und Finanzierung G.m.b.H., Mulheim (Ruhr), Germany, a company of Germany

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Claims priority, application Germany, May 27, 1961,

Sch 29,772; Jan. 19, 1962, Sch 30,854

6 Claims. (Cl. 209—394)

My present invention relates to sieves and, more particularly, to riddles and the like provided with an array of elongated sieve openings.

Sieves with elongated openings are known in many different forms and have been used heretofore for the separation of solids from fluids, for the classification and separation of solids of different sizes, and as grates for facilitating the passage of fluids through solids. In general, such sieves or riddles have comprised a support frame or box-like structure, an opening of which was spanned by a generally planar sieve surface provided with perforations to facilitate the passage of liquids, solids and gases while preventing the passage of solids having larger particle sizes. Frequently, the sieve apparatus comprised means for oscillating the sieve in the plane of its sieve surface or transversely thereto, such means including positive action vibrators entraining the sieve at all times and resonating type vibrators adapted to oscillate the sieve at its natural frequency against a restoring force proportional to the mass of the sieve and/or a resilient suspension therefor. The present invention relates to riddles of this type.

The sieve surfaces of hitherto existing riddle apparatus have generally been formed by a plurality of parallel steel rods or strips separated by gaps of predetermined gauge. This arrangement had the disadvantage that the rods were readily corroded when chemically active material was passed through the gaps between them. The mechanical characteristics of the rods also rendered them unsuitable in many cases since they were susceptible to metal fatigue and often broke after a relatively short period in use. Attempts to avoid the use of metal rods and to replace them with rubber threads also were ineffective since such threads stretched and relaxed non-uniformly so as to affect the size of the gaps formed between them and, consequently, the mesh of the screen. The disadvantages of both types of known riddle constructions, especially in the treatment of comminuted ores, and the preparation of ores for reducing furnaces with the aid of so-called shaking screens or oscillating tables, will be readily apparent. It has also been known to provide dressing tables for ores and the like with thick rubber plates formed with many small perforations which overlie a heated or unheated dressing plate. This apparatus, although somewhat suitable for the treatment of floatation slurries in ore classification and separation processes has not found considerable use in the absence of the aforementioned support or dressing plate, since it frequently stretched inordinately and resulted in an alteration of the gap size. It is an object of the present invention to provide an improved slotted sieve or riddle adapted to avoid the disadvantages of earlier devices of this character.

A more particular object of the invention is to provide a slotted sieve having openings of adjustable width.

These objects are realized according to the invention by the provision of a riddle with a generally planar sieve surface having through-going slots, the sieve being formed from elastic material, and a frame surrounding the sieve surface. Advantageously, means are provided to tension the sieve against the frame and to stretch it relatively to the frame thereby selectively adjusting the width of the slots. The resiliently yieldable sieve may be composed of rubber or any other elastomer, including any of the

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known resiliently deformable synthetic resins. In general, the tensioning means will be effective in a direction transverse to the major dimension of the slots a substantial number of which extend codirectionally within the sieve.

Thus, according to one aspect of the instant invention, a riddle comprises a frame and a sieve spanning said frame formed integrally from a sheet of elastically deformable material. The sieve is provided with elongated through-going slots at least some of which extend codirectionally and is stretched by a tensioning member in a direction transverse to these slots. Moreover, the invention contemplates providing the sieve with reinforcing elements extending generally parallel to the codirectional slots. The elongated elements form a parallel array with transverse spacing between which the slots are formed. According to a more particular feature of the invention the slots may have a length on the order of one or several centimeter and an adjustable width ranging from a fraction of a millimeter up to several millimeters, depending upon the degree of tensioning of the sieve. The elongated elements and the slots may extend in the longitudinal direction of a generally rectangular sieve or in transverse direction as desired. The invention also contemplates the arraying of slots in lines extending in their major dimension or in staggered or checkerboard patterns.

According to another aspect of the invention the sieve is composed of a plurality of elongated members joined laterally by webs of elastically deformable material which may be stretched to provide the gaps. Thus, the webs may consist of resilient bands of, say, rubber, synthetic resin or other elastomer, which extend transversely of the elongated members at spaced-apart locations. These tensionable bands are secured to the elongated members so that upon stretching the latter spread to form the gaps. Advantageously, the elongated members are also provided with tensioning elements (e.g. plastically deformable steel strips) which extend along them remote from the material-processing surface of the sieve.

According to a more particular feature of the invention the reinforcing elements may be wholly or partly embedded in the sieve so as to limit the possibility of corrosion. If exposed, the elements are preferably of a corrosion-resistant material, such as stainless steel or Monel metal. The plastic deformability of the elements permits the sieve to be shaped into substantially any suitable configuration, e.g. a surface wherein the elements extend along generatrices so that formation of filter vessels, sieve troughs, cylinders or the like is possible.

A riddle according to the invention may be provided with vibrating means of a character previously described for reciprocating it preferably in a direction transverse to the direction along which the reinforcing elements and slots extend. It has been found that such reciprocation results in a self-clearing of the sieve surface so that the need for periodic halting of operations is avoided. Furthermore, it is not necessary to remove the sieve in order to release particles entrapped within the slots inasmuch as a further tensioning of the sieve will increase the width of the slots to permit any entrapped particles to fall through. Consequently, a riddle according to the invention is particularly suitable for use in the separation of liquids from solids and the classification of solids of different particle sizes. The aforementioned construction also facilitates the bolting of the sieve to its frame.

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being had to the accompanying drawing in which:

FIG. 1 is a plan view of a riddle according to the invention;

FIG. 2 is a cross-sectional view taken along the line II—II of FIG. 1;

FIG. 3 is a cross-sectional view taken along the line III—III of FIG. 1;

FIGS. 4 and 5 are cross-sectional views corresponding substantially to the view of FIG. 2 but showing two modifications of the sieve structures in enlarged scale;

FIG. 6 is an enlarged plan view of a portion of the sieve surface shown in FIG. 1;

FIGS. 6A, 6B and 6C are views similar to FIG. 6 showing modified slot arrangements according to the invention;

FIG. 7 is a plan view of a riddle according to another embodiment of the invention;

FIG. 8 is a cross-sectional view taken along the line VIII—VIII of FIG. 7;

FIG. 9 is a cross-sectional view taken along line IX—IX of FIG. 7;

FIGS. 10—13 are cross-sectional detail views, drawn to enlarged scale, illustrating further embodiments of my invention;

FIG. 14 is a cross-sectional view similar to FIG. 8 showing a tensioning device for the sieve;

FIG. 15 is a plan view showing a further tensioning device; and

FIG. 16 is a perspective view of a trough-shaped sieve according to the invention.

In FIG. 1 I show a riddle which comprises a frame member 1 disposed along one edge of a rectangular sieve 3 of elastically deformable material such as rubber, synthetic rubber, plastic or the like. Sieve 3 is formed with through-going slots 2 in the gaps between an array of transversely spaced elongated reinforcing elements 4. Along the longitudinal edges of the sieve, resilient bands 14' are provided spanning the elements 4. As illustrated, sieve 3 is integrally formed from a sheet of elastically deformable material and has its lateral edges 3' lodged in the angle-bar frame member 1. The sieve 3 is clamped in the frame via bearing strip 7, a clamping plate 8 and bolts 9 extending perpendicularly to the plane of the sieve for urging the plate 8 against the sieve. The latter is provided with a material-receiving surface 3'' overlain by a pair of conventional retaining bars 30 which confine the material to be processed to a limited region of the sieve. As will be described in greater detail hereinafter, the sieve 3 is tensioned via frame member 1 within support 31 via bolts 32 and nuts 33. Support 31 is schematically shown to be positively reciprocated by a motor 34 via its eccentric 35. The latter arrangement, shown in FIG. 3, oscillates the sieve 3 generally in the direction of arrows 5, i.e. in the direction in which the slots 2 and the elongated elements 4 extend.

Strips 14' and the portions of sieve 3 intermediate elements 4 constitute stretchable webs which permit the selective elongation of sieve 3 via nuts 33 to adjust the width of slots 2.

As indicated in FIG. 4 the reinforcing elements 4 may be corrosion-resistant strips partly embedded in the sieve 3 and securely bonded thereto, e.g. by vulcanization, with the aid of a cementitious substance, or by thermal fusion.

In the arrangement shown in FIG. 5 the strips 4a constituting the reinforcing elements are wholly embedded within the sieve 3a between its row of slots 2a. In this case, the strips 4a need not be corrosion-resistant since the sieve material, forming a sheath around them, constitutes an encasing layer of corrosion-resistant material.

In FIG. 6 I show the slots 2 with greater detail. As illustrated, the extremities of the slots are provided with means, in the form of bores 6, for preventing the rupture of sieve 3 at these extremities upon tensioning of the sieve. It is also possible to provide reinforcing inserts and to form the slots with angular portions at these extremities in order to prevent tearing. While the arrangement shown in FIGS. 1-6 provides the slots 2 in rows extending along their major dimensions, it should be noted

that a checkerboard configuration is also possible. In FIG. 6A for example, I show the sieve 3b to be provided with slots 2b extending generally transversely to the direction of tensioning (arrow 36) offset in a checkerboard pattern from slots 2b' extending parallel to the direction of tension. Slots 2b, of course extend parallel to the reinforcing elements 4b which are generally similar to the elements 4 previously described. The elements may be spanned by resilient reinforcing bands 37 is desired. It should be noted that tensioning of the sieve 3b in the direction of arrow 36 will result in a widening of the slots 2b but in a slight reduction of the width of slots 2b'. Another checkerboard configuration is shown in FIG. 6B wherein slots 2c extend parallel to the elements 4c while slots 2c' extend transversely thereto. Nuts 2c and 2c' are grouped within squares generally in accordance with a checkerboard pattern. In FIG. 6C the sieve 3d is shown to be provided with a checkerboard array of slots 2d extending only parallel to the reinforcing elements 4d.

In FIG. 7 I show another riddle wherein a sieve 3e is formed by a plurality of parallel elongated members 12 bridged by resilient webs 13 permitting the sieve to be tensioned in the direction of arrows 36e. The members 12 have corresponding upper surfaces substantially contiguous in a relaxed condition of the sieve but spaced transversely to define slots 2e upon tensioning of the sieve against its frame 10. As indicated in FIG. 8, the sieve is carried by a support 31e resiliently mounted on springs 40 which tend to return the sieve to an intermediate position upon its intermittent displacement in the direction of arrow 5e by a cam 41 driven by motor 34e. The reciprocating arrangement constitutes a non-positive vibrator for the sieve which oscillates at a natural frequency determined by its mass. From FIG. 10 it may be seen that elongated members 12 may each consist of a core 4e of a synthetic resinous material encased in a sheath 11. The sheaths 11 may be thermally welded to synthetic resin bands 14 which can be stretched in the direction of arrow 36e. The bands 14, of course, serve a function similar to that of webs 13 previously described. In FIG. 11, I show an arrangement wherein each elongated member 12 is bonded to a strip 14f of rubber along its upper surface.

In a modified arrangement of the riddle (FIGS. 12 and 13), the elongated members 12g with their sheaths 11g encasing reinforcing elements 4g are lodged in a channel-shaped resilient strip 15 and are bonded thereto with the aid of a cementitious material. Again, extension of the strip 15 in the direction of arrow 36g results in a spreading of the members 12g to define the slots 2g. The latter diverge downwardly away from the material-receiving surface of sieve 3g.

In FIG. 14, I show an arrangement for tensioning the sieve 3e of FIG. 7 against its frame 10. The strips 14 are engaged by a bearing plate 18 whose corner 18' is rounded to prevent tearing of the sieve. A bolt 32e draws the strip 14 in the direction of arrow 36e against frame member 10 upon the tightening of its nut 33e. The members 12, of trapezoidal cross-section, are thus spread to define the slots 2e. In FIG. 15 the tensioning means comprises a bar 45, forming part of the frame 10, in which the channel 15 of FIG. 13 is secured. Bar 45 is displaceable in the direction of arrow 36g by a butterfly nut 19 on screw 32g secured to this bar. An arm 46, rigid with a further frame member 47, serves as a brace against which bar 45 and the sieve 3g are drawn in the direction of arrow 36g.

FIG. 16 shows an arrangement, according to the invention, wherein the yieldably deformable bars 4h are bent into a trough-configuration and extend along generatrices thereof. The resulting concave sieve 3h may be stretched in the direction of arrows 36h to vary the widths of its slots 2h.

The invention as described and illustrated is believed to admit of many modifications within the ability of persons skilled in the art and deemed to be included within the spirit and scope of the appended claims.

I claim:

1. A riddle comprising a supporting frame; a sieve spanning said frame, said sieve having a planar array of codirectionally extending parallel elongated generally rigid spaced elements forming a plurality of elongated throughgoing slots, and resilient means interconnecting laterally adjacent ones of said elements; and tensioning means including said frame for stretching said resilient means, thereby adjusting the widths of said slots, said array having a receiving surface for a substance to be separated, said tensioning means including a tightening member for stretching said sieve in a direction generally transverse to the major dimension of said slots, said resilient means being constituted by at least one planar strip of an elastomeric material inherently elastically stretchable in its plane extending parallel to said surface and bonded to said elements.

2. A riddle as defined in claim 1 wherein said elements are resiliently deformable corrosion-resistant bars.

3. A riddle as defined in claim 1 wherein said elements are metallic bars each encased in a sheath of a corrosion-resistant material.

4. A riddle comprising a supporting frame; a sieve spanning said frame, said sieve having a planar array of codirectionally extending parallel elongated generally rigid elements forming a plurality of elongated throughgoing slots, and resilient means interconnecting laterally adjacent ones of said elements; and tensioning means including said frame for stretching said resilient means, thereby adjusting the width of said slots, said array having a receiving surface for a substance to be separated, said tensioning means including a tightening member for stretching said sieve in a direction generally transverse to the major dimension of said slots, said resilient means including at least two spaced-apart transversely extending deformable bands of elastomeric material secured to each

of said elements, said tightening member being adjustable in transverse direction for stretching said bands.

5. A riddle according to claim 4 wherein said elements are of trapezoidal cross-section and form tapering slots diverging away from said surface.

6. A riddle according to claim 5 wherein said elements have corresponding faces forming said surface, said faces being substantially contiguous laterally in a relaxed condition of said band and defining said slots between them in a stretched condition thereof.

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HARRY B. THORNTON, *Primary Examiner*.

HERBERT L. MARTIN, *Examiner*.