

Dec. 16, 1969

D. E. ANDREWS

3,483,912

SHAKER SCREEN

Filed June 28, 1968

2 Sheets-Sheet 1

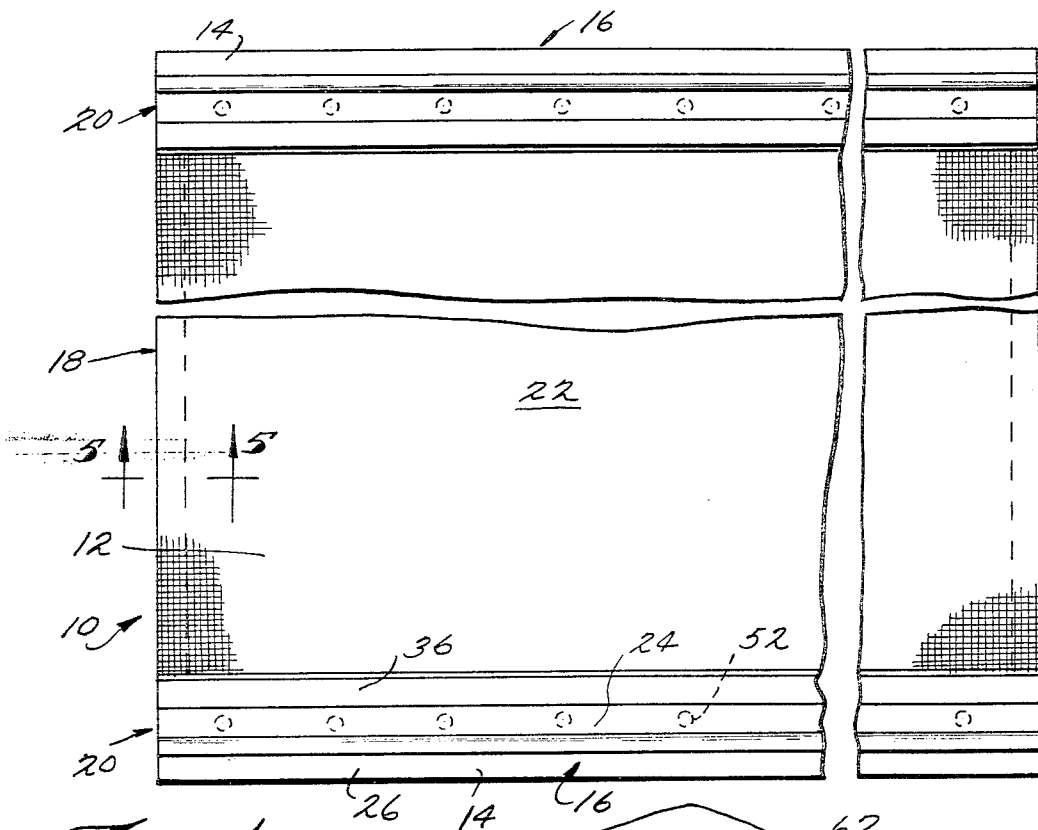


Fig. 1.

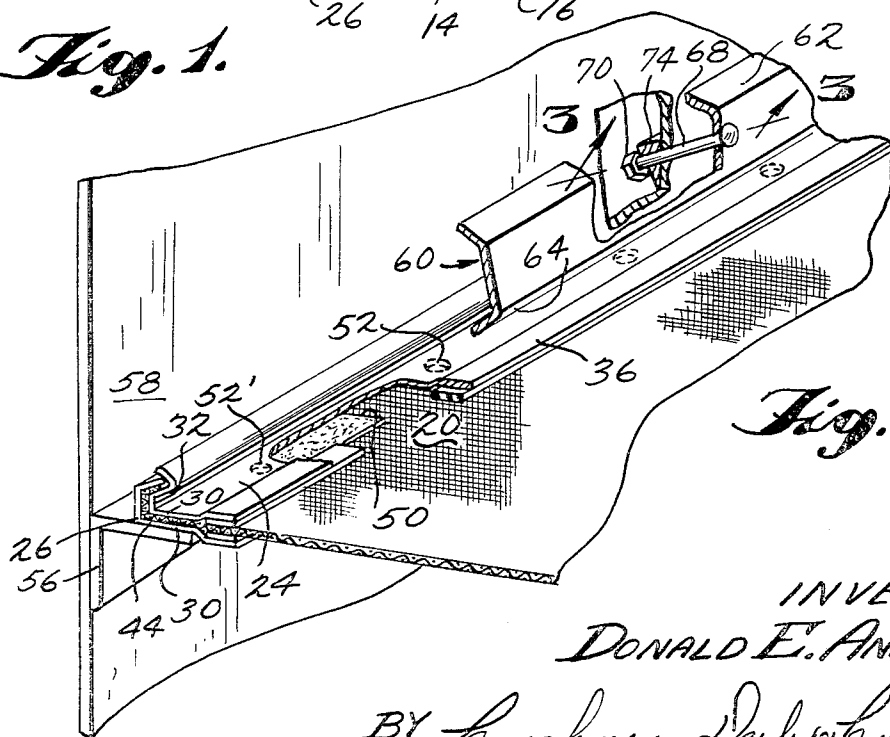


Fig. 2.

INVENTOR
DONALD E. ANDREWS

BY *Cushman, Dalrymple & Cushman*
ATTORNEYS

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2 Sheets-Sheet 2

Fig. 3.

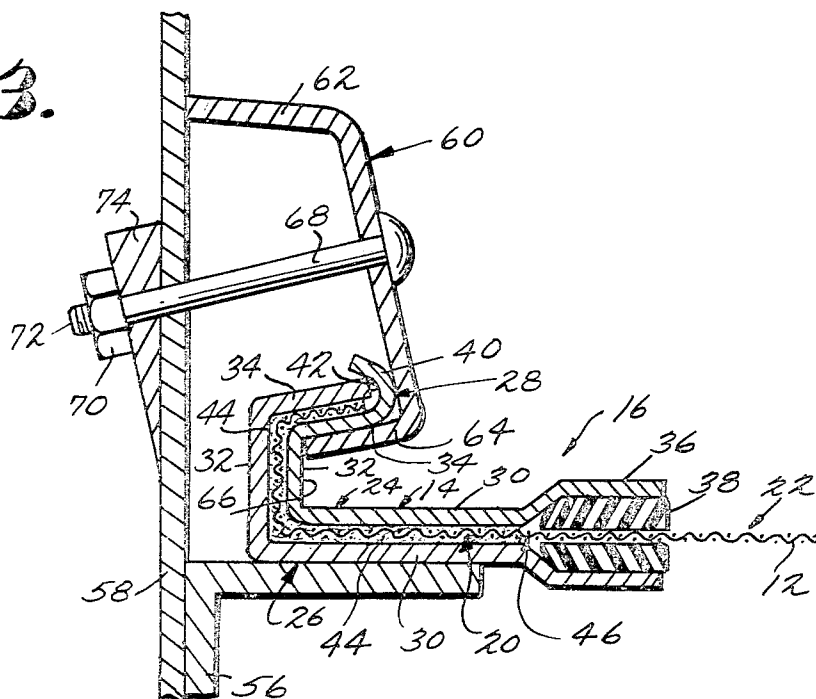


Fig. 4.

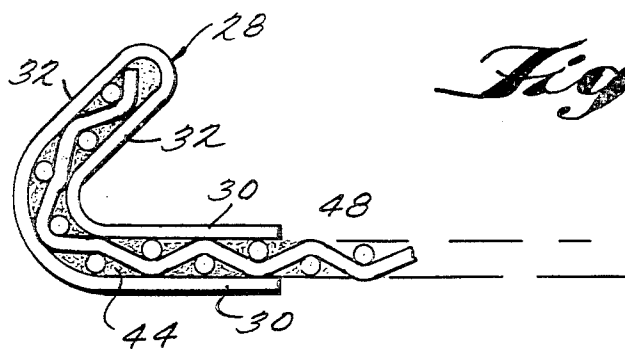
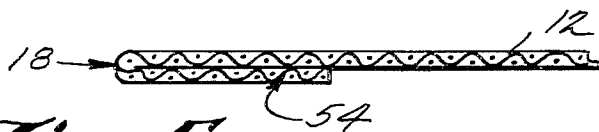


Fig. 5.



INVENTOR

DONALD E. ANDREWS

BY *Cushman, Darby & Cushman*
ATTORNEYS

1

3,483,912

SHAKER SCREEN

Donald E. Andrews, Cambridge, Md., assignor to Cambridge Wire Cloth Company, Cambridge, Md., a corporation of Maryland

Filed June 28, 1968, Ser. No. 741,003

Int. Cl. E06b 3/80

U.S. Cl. 160—327

21 Claims

ABSTRACT OF THE DISCLOSURE

An improvement in a shaker screen of the type having opposite sides of rectangular wire screen engaged in a pair of metal binders comprising the use of a non-yieldable, rigid, settable composition inserted in the metal binders and intermeshed with the marginal longitudinal sides of the wire screen at least adjacent to the free transverse edges thereof. The settable composition can extend along the entire length of the marginal side of the wire screen to form a consolidated body therewith and mechanically interlock with the binder, or the settable composition can be inserted only at the corners of the screen with the screen held in the binder by spot welds or the like.

BACKGROUND OF THE INVENTION

The invention relates to shaker screens and more particularly to an improved binding means for securing the marginal edges of wire screens.

The prior art is typified by the Mowbray patent, No. 2,271,900 of Feb. 3, 1942, in which a rectangular wire screen is engaged by a pair of binders on its opposite longitudinal side edges. Screens of this general type have been used for many years, but such screens have always been subject to early failure along the transverse end edges (i.e., those not received within the binder). Failure of an unsupported transverse edge, of course, is not a problem with rectangular shaker screens having a binder on all four edges or with circular shaker screens. In such embodiments, failure is often dependent upon the means for securing the screen within the binder, such as by welding, riveting deforming, or another similar method. In continuous operations where aggregate or the like moves longitudinally of the shaker screen, it is desirable not to bind the transverse end edges of the screen.

The failure problem with unsupported, transverse end edges has resulted in attempted corrected measures, such as doubling over the screen edge or using a filler bar between a lap of the screen edge. While some improvement has been achieved, the problem has not been substantially reduced.

The failure problem is created by a minute amount of slippage of wires at the transverse end edges of the screen with respect to the binder at the transverse end edges of the screen. Such slippage is a minimum in the immediate vicinity of the spot weld, increases with distance from the spot weld, and becomes a maximum at the four corners. The slippage results in loss of tension and causes such wires to become significantly less taut so that the transverse end edge of the screen vibrates out of frequency or amplitude with the rest of the screen. The relative motion between the transverse end edges and the center portion of the screen causes greater flexure in the edge wires and results in more rapid fatigue. Fatigue eventually produces a crack on one edge transverse wire, which crack acts as a stress concentration point thereby soon leading to a rip extending from the transverse end edge of the wire screen towards its center.

2

SUMMARY OF THE INVENTION

It is an object of the invention to overcome the problems mentioned above. This object is accomplished by inserting in the metal binder a non-yieldable, rigid, settable composition which intermeshes with the marginal longitudinal sides of the wire screen at least adjacent the transverse end edges of the wire screen. This composition forms a consolidated or composite structure with the wire screen and prevents or substantially eliminates slippage of the wires along the transverse end edge of the screen. Slippage is prevented by the settable composition being intermeshed with the wire screen, and by the shape of this composite or consolidated structure when such shape forms a mechanical interlock, with the binder with respect to and against the direction of tensile pull to resist such pull. The consolidated structure (i.e., the settable composition and the wire screen) is molded into the shape of the binder. To the extent that this moldable, composite structure has a component extending angularly with respect to the general direction of tensile pull by the screen the composite, molded structure will mechanically interlock with the binder against the pull of the screen and thus operates to hold the screen in the binder.

In the preferred embodiment, the settable composition extends longitudinally of the screen and binder and terminates inwardly of the transverse end edge of the screen. Preferably, the settable composition terminates inwardly of the outer spot weld (i.e., on the opposite side of the weld from the adjacent transverse edge). In other words, the settable composition is inserted in the four corners of the pair of binders. The wire screen is held in the binder by a series of spot welds, rivets or other clamping means extending longitudinally of the binder, with the settable composition preventing or substantially reducing transverse slippage of the transverse wires at the end edges of the screen.

On the other hand, the settable composition could extend longitudinally of the binder from one transverse end edge to the other transverse end edge. The screen would then be held within the binder by the mechanical interlock of the molded, composite structure and the binder. Of course, if the settable composition has some adhesive characteristics, the retention of the screen in the binder could be aided by these adhesive characteristics.

Some adhesives, such as epoxy resins, could be employed for adhesively binding the screen to the binder, and the adhesive would naturally intermesh with the screen. However, reliance solely on the adhesive properties of a compound may not necessarily achieve the object of this invention. Many adhesives are formulated to produce a flexible composition after curing whereas the settable composition referred to in this invention requires a non-yieldable, rigid formulation. Further, use of an adhesive results in other problems because of the conditions required for obtaining a good adhesive bond. These conditions consist of having to thoroughly clean the metal binder so as to remove all oil therefrom. Binders are often oily since a lubricant is sometimes used in bending the binders into shape. Not only does the cleaning take a considerable amount of time, but once the epoxy has been inserted between the plates of the binder, the binder must be clamped for many hours until the epoxy is dried or set up. Such delays obviously add considerable expense to the process of making shaker screens. Accordingly, another object of one embodiment of the present invention is to rely upon the shape of the settable composition for mechanically interlocking the screen and settable composition in the binder rather than relying upon the adhesive nature of the settable composition.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a plan view of the improved shaker screen;

FIGURE 2 is a fragmentary perspective view of one corner of the screen mounted upon the framing structure of a shaker machine and with parts broken away for clarity;

FIGURE 3 is an enlarged sectional view taken along the line 3—3 of FIGURE 2 with the settable composition inserted in the binder for illustrative purposes;

FIGURE 4 is a fragmentary, side elevational view of the transverse end edge of the shaker screen with a modified configuration for the binder; and

FIGURE 5 is a section view taken substantially along the line 5—5 of FIGURE 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The improved shaker screen 10 comprises the usual wire screen 12 and a pair of binders 14 arranged at the opposite longitudinal sides 16 of the screen. For illustrative purposes, the binder sides of the screen are described as the longitudinal sides or edges 16 and the unsupported opposed edges are described as the transverse ends or end edges 18. Moreover, for illustrative purposes, the screen is described as having marginal portions 20, which are defined as those portions of the screen received in the binders and extending along the longitudinal sides of the screen, and a central (i.e., transversely central) portion 22, which is defined as that portion of the screen between the opposed marginal portions 20. The wire screens can have any desired mesh and weave. The binders are preferably metal.

FIGURES 2 and 3 disclose the construction of the binder 14 in greater detail. The metal binder is described as having a top or upper plate 24 and a bottom or lower plate 26 which may or may not be integrally connected at their outer longitudinal edges or ends 28. As illustrated in FIGURES 2 and 3, these plates are not integrally connected although they are hooked together. In FIGURE 4, the top and bottom plates are integrally connected at one end to form a one-piece binder or mold. The binder 14 (comprising the top and bottom plates) has a first leg 30 which lies adjacent the central portion of the wire screen and extends generally in the same direction as the adjacent central portion of the wire screen. It will be appreciated that the wire screen, rather than lying substantially horizontal, could be arched transversely by guides, not shown, positioned longitudinally under the screen.

The binder is folded about a longitudinal axis so as to form a second leg 32 which is integrally connected to the outer end of the first leg and which is described as being angularly inclined with respect to the first leg. When this leg 32, or any other leg, is described as being angularly inclined with respect to another leg, it does not necessarily mean that the two legs are straight. The legs can either be straight or arcuate or a combination of both.

As illustrated in FIGURES 2 and 3, the binder has a third leg 34 integrally connected to the outer end of the second leg 32 and angularly inclined with respect to the second leg. The third leg extends generally inwardly towards the central portion of the screen so as to result in the metal binder being doubled back on itself.

A binder with a modified configuration having two legs, 30 and 32, is shown in FIGURE 4 and forms a single reinforced hook. Naturally, one could come up with many variations in the configurations of the binder and still come within the scope of this invention.

The inner marginal longitudinal edge portion 36 of the binder in FIGURES 2 and 3 is offset outwardly to accommodate a cushioning means 38, such as a rubber strip, which preferably is fastened with an adhesive to the binder. The cushioning means preferably extends transversely to or beyond the longitudinal edge of the binder, as shown more particularly in FIGURE 3, so as

to prevent the wire screen from being bent against the edge of the binder. As is also shown in detail in FIGURE 3, the outer marginal portion 40 of the top plate of the binder is hooked or bent over the outer edge 42 of the bottom plate 26 of the binder. Of course, this configuration is specifically applicable to two-piece binders.

A non-yieldable, rigid, settable composition 44, adapted to intermesh with the screen and infiltrate the meshes thereof, is preferably inserted in each binder from a point adjacent the outer longitudinal edge 28 of the binder to a point 46 adjacent the beginning of the offset portion 36 of the binder. The settable composition preferably does not extend between the cushioning means 38. If the settable composition extended to the inner edge of the binder, there would be an abrupt transition from the rigid binder to the flexible screen and flexure would be concentrated at that point. Consequently, fatigue and failure at the point where the screen exits from the settable composition would result. By terminating the settable composition transversely outwardly of the cushioning means at approximately the point 46 where the offset portion of the binder begins, the cushioning means can then operate to reduce the vibration and frequency amplitude of the wires in the region where they come out of the settable composition. This problem is inherent with fine wire, such as .010" diameter wire, and cushioning means is generally used with fine wire. On the other hand, some shaker screens are made of wire which might be .25" or .5" diameters. In such cases, as illustrated in FIGURE 4, the cushioning means is generally not employed and, the settable composition could extend to a point adjacent to the inner longitudinal edge 48 of the binder.

The critical location of the settable composition is adjacent the transverse ends or edges of the wire screen. Thus, the settable composition is shown inserted in the binder at the four corners of the wire screen. As shown in FIGURE 2, the settable composition extends longitudinally inwardly of the binder to a point 50 which is preferably beyond the first or outer spot weld 52', at which point the settable composition terminates. For example, the settable composition might extend longitudinally inwardly for approximately 1.5 inches. Thus, in this embodiment of the invention it is not necessary for the settable composition to extend throughout the length of the binder. Spot welds 52 along the length of the binder clamp the top 24 and bottom 26 plate together with the screen inserted therebetween. Obviously, the outer spot weld or any spot weld within the area of the settable composition also clamps the settable composition in between the top and bottom plates of the binder. Even if the settable composition does not extend inwardly beyond the outer spot weld, the fact that the screen is an integral, composite structure will result in the settable composition being held within the binder. The other spot welds will clamp the top and bottom plates of the binder against the settable composition. It will be appreciated that other clamping means such as riveting or bolting could be used in place of spot-welding although spot-welding is preferable.

Another embodiment of the invention is illustrated, for the purpose of discussion, by the sectional view shown in FIGURE 3 wherein the settable composition extends the length of the binder. Because the binder acts as a mold for the settable composition and has at least one leg 32 angularly inclined with respect to the first leg 30, there will be a mechanical interlocking between (a) the composite or consolidated structure formed of the settable composition and the wire screen embedded therein, and (b) the mold or binder. Thus, the screen will be held within the binder. Of course, spot welds could additionally be used with this embodiment if desired.

The mechanical interlock results because the angularly inclined leg 32 is angularly inclined also with respect to the general direction of tensile pull of the wire

screen. The binder, being held on the shaker machine, not shown, pulls the screen taut. The mechanical interlock prevents the screen from being pulled from the binder. It will be appreciated that while the angularly inclined leg 32 resists the pull of the screen from the binder, the first leg 30 retains the composite structure within the inclined leg 32. Otherwise, the composite structure might be pulled out of the inclined leg and snapped off.

The settable composition could comprise an organic agent such as a thermosetting or thermoplastic resin. Representative thermosetting resins include phenolics such as Bakelite which is a reaction product of phenol with formaldehyde, urea and melamine resins; alkyd and polyester resins; and epoxy resins. Representative thermoplastic resins include polyolefins such as polypropylene; polyfluorohydrocarbons; vinyl polymers such as vinyl chloride; polystyrene; acrylics such as ethylacrylate and methacrylate polymers; the polyformaldehyde resins; and polycarbonate resins. On the other hand, the settable composition could include inorganic agents such as solder, lead or the like. The settable composition is thus a material which in one condition will be moldable and in another condition will be non-yieldable and rigid. Any non-yieldable, rigid, composition can be used which will prevent or substantially eliminate slippage of the transverse wires of the screen. Preferably, the rigid composition will have a tensile modulus, as determined by ASTM method D638-56T, of 170,000 p.s.i. or greater and more preferably having a tensile modulus, as determined by ASTM method D638-56T, of 300,000 p.s.i. or greater.

The viscosity of the settable composition in its initial condition determines in part the manner of application. Thus the settable composition could be applied to the screen which is then inserted in the binder or, preferably, it could be placed in the binder or on the binder plates if a two-piece binder is used. Thereafter, the screen is placed in the binder.

One further modification for increasing the strength of the unsupported, free transverse edges of the shaker screen is to double the edges over, as shown in FIGURE 5. This doubled over edge 54 receives the settable composition in the binder.

FIGURES 2 and 3 illustrate the shaker screen in use. The binder rests upon an angle member 56 secured to a framing member 58 of the shaker machine, not shown. A channel member 60 having one leg 62 engaging the frame member 58 and the other leg 64 engaging the inwardly facing surface 66 of the binder is used to pull the shaker screen taut. A bolt 68 extends through the channel member and through the frame member. A nut 70 is inserted on its free end 72 and is tightened against a block 74 abutting the outside of the frame member. By tightening the bolt, the binder will be clamped and pulled toward the frame member so as to keep the wire screen taut.

Heretofore, the settable composition has been shown inserted in all legs of the binder. Within the scope of the invention the settable composition could be inserted in only one or two legs of the binder. For instance, the settable composition could be inserted only in the second leg 32 of the binders shown in FIGURES 3 and 4. Slippage of the wires would be prevented by the settable composition being intermeshed with the screen and a mechanical interlock would likewise be achieved. On the other hand, use of the settable composition only in leg 30 of the binders shown in FIGURES 3 and 4 would prevent slippage because the settable composition was intermeshed with the screen but there would be no mechanical interlock. In this latter case, the spot welds would have to hold the screen in the binder.

While the preferred forms of the invention have been illustrated in the drawings and discussed above, it should be adequately clear that considerable modification may be made thereto without departing from the principles of the invention.

What is claimed is:

1. A shaker screen comprising:

a rectangular wire screen having opposite longitudinal sides and opposite transverse ends, the screen having a marginal portion along the opposite sides and a central portion extending between the marginal portions;

a pair of metal binders, each binder having a top and bottom plate receiving therebetween one marginal side portion of the wire screen;

a non-yieldable, rigid, settable composition received between the metal binders and intermeshed with the marginal side portions of the wire screen at least adjacent the transverse end edges of the wire screen; and

means for clamping the marginal side portions of the wire screen and the settable composition between the top and bottom plates of each binder.

2. The shaker screen defined in claim 1 wherein the metal binder has a first leg adjacent the central portion of the wire screen and extending generally in the same direction as the adjacent central portion of the wire screen and a second leg integrally connected to the outer end of the first leg and angularly inclined with respect to the first leg and wherein the settable composition and wire screen are received in both legs.

3. The shaker screen defined in claim 2 wherein the second leg is gradually folded about an axis extending generally longitudinally of the binder to form a hook.

4. The shaker screen defined in claim 2 additionally comprising a third leg integrally connected to the outer end of the second leg and angularly inclined with respect to the second leg so as to double the metal binder back upon itself and wherein the settable composition and wire screen are received in all three legs.

5. The shaker screen defined in claim 1 wherein the settable composition comprises a thermoplastic resin.

6. The shaker screen defined in claim 1 wherein the settable composition comprises a thermosetting resin.

7. The shaker screen defined in claim 1 wherein the settable composition comprises lead.

8. The shaker screen defined in claim 1 wherein the settable composition comprises solder.

9. The shaker screen defined in claim 1 wherein the binders have outwardly offset marginal edges and additionally comprising cushioning means secured in the offsets.

10. The shaker screen defined in claim 9 wherein the settable composition extends transversely inwardly from the outer edge and terminates adjacent the beginning of the offset marginal edges so that the cushioning means are substantially free of settable composition therebetween.

11. The shaker screen defined in claim 1 wherein the means for clamping the top and bottom plates of each binder comprises spot welds.

12. The shaker screen defined in claim 11 wherein the settable composition extends from each transverse end of the wire screen longitudinally inwardly and terminates longitudinally inwardly of the outer spot weld.

13. The shaker screen defined in claim 1 wherein each transverse end of the screen is bent over on itself to form a lapped edge.

14. The shaker screen defined in claim 1 wherein the settable composition extends longitudinally through the entire length of the marginal side portions of the wire screen.

15. In a shaker screen of the type comprising a rectangular screen having opposite longitudinal sides and opposite transverse ends, a pair of metal binders, each binder having a top and bottom plate receiving therebetween the marginal side portion of one of the opposite sides of the wire screen, the top and bottom plates of the binder being welded together with the wire screen therebetween, the improvement comprising:

7

a non-yieldable, rigid, settable composition inserted between the metal binders and intermeshed with the marginal side portions of the wire screen, the settable composition extending longitudinally inwardly within the binder from each transverse end of the wire screen.

16. The shaker screen defined in claim 15 wherein the settable composition terminates longitudinally inwardly of each transverse end and longitudinally inwardly of the outer spot weld.

17. A shaker screen comprising:

a rectangular wire screen having opposite longitudinal sides and opposite transverse ends, the screen having a marginal portion along the opposite sides and a central portion extending between the marginal portions;

a pair of metal binders, each binder having top and bottom plates defining therebetween a mold for receiving the marginal portion of one of the opposite sides of the wire screen, the mold having a first leg adjacent the central portion of the wire screen and extending generally in the same direction as the adjacent central portion of the wire screen and a second leg integrally connected to the outer end of the first leg and angularly inclined with respect to the first leg; and

a non-yieldable, rigid, settable composition received in the mold and intermeshed with the marginal side portions of the wire screen to form a consolidated body conforming in shape to the shape of the mold, the consolidated body mechanically interlocking with

8

the mold legs so as to hold the wire screen within the mold.

18. The shaker screen defined in claim 17 wherein the settable composition comprises a resin.

19. The shaker screen defined in claim 17 additionally comprising spot welds in the first leg of the binder clamping the screen, settable composition, and plates of the binder together.

20. The shaker screen defined in claim 19 wherein the settable composition extends from each transverse end longitudinally inwardly in the binder and terminates longitudinally inwardly of the outer spot weld.

21. The shaker screen defined in claim 17 wherein the settable composition extends longitudinally throughout the entire length of the marginal side portions of the wire screen.

References Cited

UNITED STATES PATENTS

2,271,900	2/1942	Mowbray	209—403
2,368,053	1/1945	Van Voorhees	160—391
2,886,481	5/1959	Swan	160—391
3,186,547	6/1965	Behnke	209—403
3,243,042	3/1966	Moulton	
3,276,513	10/1966	Lemelson	160—371

DAVID J. WILLIAMOWSKY, Primary Examiner

PHILIP C. KANNAN, Assistant Examiner

U.S. Cl. X.R.

160—380, 391; 209—403