Aug. 20, 1963 L. W. JOHNSON 3,101,314

SCREEN DECK CONSTRUCTION

Filed Sept. 21, 1961

Fig. 1

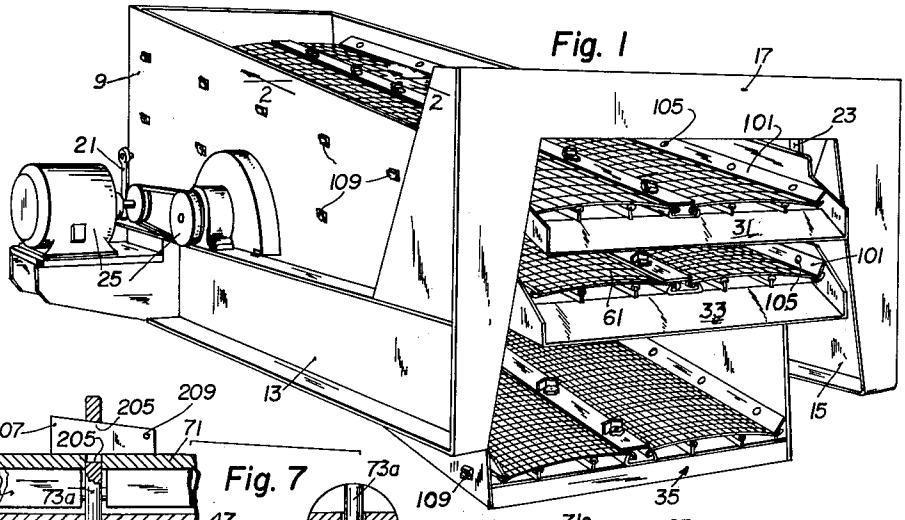


Fig. 7

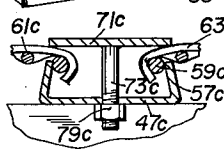


Fig. 9

Fig. 2

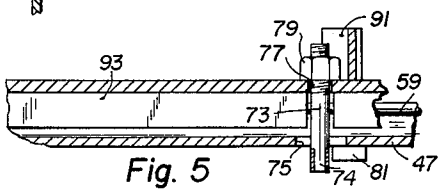


Fig. 5

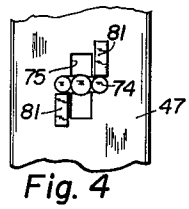


Fig. 4

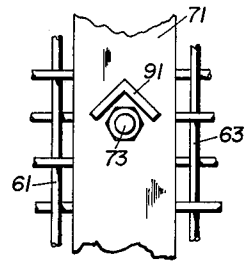


Fig. 3

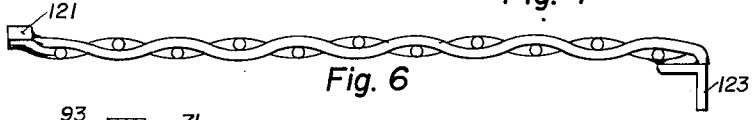


Fig. 6

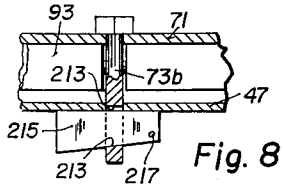


Fig. 8

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United States Patent Office 3,101,314 Patented Aug. 20, 1963

3,101,314

SCREEN DECK CONSTRUCTION

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Filed Sept. 21, 1961, Ser. No. 139,785
8 Claims. (Cl. 209—319)

This invention relates to vibrating screens, such as screens for screening crushed rock, and particularly to the construction of the screen decks of such apparatus. This application contains the subject matter of my prior application entitled "Screen Deck Construction," Serial No. 821,518, filed June 19, 1959, and is a continuation-in-part thereof. Such prior application was abandoned since the subject matter thereof was included in the present application.

Heretofore it has been common practice to utilize a single piece or section of screen cloth for a deck, but various difficulties are encountered in wide deck constructions. For instance, it has been found that two support rails for the screen cloth for a wide deck are not sufficient to properly support the cloth, and that if another rail is added, proper contact with the three rails is not easy to obtain. It has been proposed to add a center rail with a tie-down arrangement in which holes are cut in the screen cloth to accommodate tie-down bolts, but this has been unsatisfactory for a number of reasons.

It is a main object of the present invention to overcome the above difficulties, and more specifically to provide a deck in which the screen cloth is divided into two sections longitudinally of the deck.

Another object of the invention is to provide a novel arrangement for clamping the inner or central margins of the two screen sections in place.

A further object of the invention is to provide a novel structure for supporting the side margins of the two sections of screen, and also to provide such a novel supporting structure that is capable of tensioning the screen sections.

A still further object of the invention is to provide a construction for holding down the central or inner margins of the two sections of screen by means of bolts, the arrangement being so constructed that the bolts can be removed without unthreading the nuts on the bolts.

Another object of the invention is to provide a novel section of screen cloth designed to be held in place by clamping arrangements of the type discussed above.

A still further object of the invention is to provide a vibrating screen in which one deck may produce two sizes of aggregate.

Various other objects of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view taken from the discharge end of a vibrating screen apparatus embodying the concepts of the present invention;

FIG. 2 is an enlarged generally vertical section taken along line 2—2 of FIG. 1 through the upper screen deck;

FIG. 3 is a top fragmentary view taken in the direction of the arrows 3—3 in FIG. 2;

FIG. 4 is a bottom fragmentary view taken in the direction of the arrows 4—4 in FIG. 2;

FIG. 5 is a vertical fragmentary section taken along line 5—5 of FIG. 2;

FIG. 6 is an end view of a modified form of screen section;

FIG. 7 is a fragmentary sectional view showing a modified form of bolt;

FIG. 8 is a fragmentary sectional view showing a further modified form of bolt; and

FIG. 9 is a vertical section showing a modified form of the invention.

Referring to FIG. 1, the apparatus includes a frame made up of a pair of side members 13 and 15 joined at the discharge or delivery end of the apparatus by an inverted U-shaped connecting structure 17 and joined at the opposite end of the machine by a cross member, not shown. The frame supports a screen box 9 for vibrating movement by means of a conventional supporting means part of which is shown at 21 and 23. A suitable mechanism indicated at 25 is provided on the frame and box for imparting vibrating movement to the box.

The box is shown as equipped with three decks 31, 33 and 35, each having a divided screen arrangement of the present invention. It is not necessary that each deck have such a divided screen arrangement, but greater effective screening area is achieved if the deck is divided, as will be pointed out hereinafter.

Part of the top deck is shown in FIG. 2, and only the details of this deck will be given. The deck comprises an open framework made up of a plurality of longitudinally extending members including two T-shaped side rails 41, one of which is shown in FIG. 2, four intermediate plain supporting rails 43 and 45, only two of which are shown in FIG. 2, and a single central channel member 47. Two intermediate rails may be provided instead of four, if desired. These longitudinally extending members are connected to a plurality of T-shaped cross members 49, one of which is shown in FIG. 2. The lower portions of the side and intermediate rails are notched to receive the cross members, and the cross members and the rails are joined at such places, such as by welding.

The upper portion of the head 51 of each side rail is equipped with an elastomer crown strip 53 formed with a groove to fit the head. The crown may be secured to the strip in any suitable manner. Similar crown strips 55 are provided on the upper edges of the intermediate rails 43 and 45.

The channel member 47 has the flange portions 57 thereof inclined inwardly, and such flange portions are equipped on the inner edges thereof with edge bars 59 which are tack welded in place so that they can be readily replaced when worn because of use. That is to say, during operation of the equipment, the intense vibration of the loaded screens may cause some slight relative movement between the screens and the bars 59, and this movement under an intense load will cause wear of the bars 59.

The deck framework described above supports two sections of screen 61 and 63. Since the screen sections are supported in a similar manner, the supporting arrangement for only the screen 61 need be described. The screen section 61 has an upwardly bent side margin 65 and a downwardly bent inner margin 67. These margins form an included angle with the body of the screen of less than 90 degrees. Preferably such angle is around 70 or 80 degrees.

The inner margin 67 fits over the associated edge bar 59 and projects downwardly into the channel member 47. The similar margin 67 of the other screen 63 likewise fits into the channel 47. These margins are clamped downwardly against the edge bars 59 by a longitudinally extending clamp plate unit which includes a clamp plate 71 having a width about equal to that of the channel, and thus greater than the distance between the centers of the edge bars 59. Thus the clamp plate firmly holds the margin of the screens in place.

Referring to FIGS. 2 and 4, the clamp plate unit includes a plurality of T-headed bolts 73 which have the shank portions thereof extending upwardly through oblong slots 75 cut in the central portion of the channel member 47. The shank portions also extend through

holes 77 formed in the clamp plate 71 as clearly shown in FIG. 5. Nuts 79 provided on the upper ends of the bolts thread down on the bolts to clamp the plates 71 firmly against the margins of the screen sections 61 and 63.

As clearly shown in FIG. 4, the heads of the bolts extend transversely with respect to the length of the channel member 47, and the slots 75 extend longitudinally of the channel member 47. A slot 75 is large enough to pass the head of the associated bolt 73 when the head of the bolt is arranged longitudinally of the channel member.

A pair of stops 81 are provided in diagonal relation with respect to each slot 75 and are secured to the underside of the channel member 47. As shown in FIG. 4 the stops 81 prevent turning movement of the head in a counterclockwise direction as the parts are shown in FIG. 4. Since this is a bottom view of the channel member 47, it is apparent that the stops 81 prevent turning movement of the head when the nuts 79 are tightened in place. However, if for any reason it is difficult to remove the nuts 79, such as, for instance, as might occur because of wearing away of the flats on the nuts, a bolt may be turned 90 degrees to place the head 74 of the bolt parallel to the length of the associated slot 75 to enable the bolt to be removed without unthreading the associated nut.

In order to lessen the likelihood of wear on a nut, an angle shield 91 is secured to the upper face of the clamp plate 71 on the upstream side of the nut to protect the nut from the aggregate traveling down the deck.

The plate 71 is reinforced along its length by vertical strips 93 centrally secured to the underside of the plate and spaced from one another to accommodate the bolts 73 as is evident from FIG. 5.

After the inner margins of the screen sections 61 and 63 are clamped in place, the outer margins of each is drawn outwardly by a clamping and tensioning arrangement best shown in FIG. 2. This arrangement includes an elongate tensioning plate 101 extending longitudinally of the deck, such plate including an outwardly bent margin 103 engaging the upstanding screen cloth margin 65. A plurality of bolts 105 extend through suitable openings formed in the plate 101 and in the associated side wall of the box 9 and also in triangular lugs 107 secured to such side wall on the outer surface thereof. Nuts 109 on the bolts 105 pull the plate 101 toward the side wall and thus tension the screen 61 and draw it over the crown rubber pieces 53 and 55 which permit such relative movement.

FIG. 6 shows a modified form of screen which is particularly adaptable for screens made of relatively large wire. By large wire, it is meant wire on the order of 7/16 of an inch to 5/8 of a inch in diameter. With this wire, it is impractical to bend the margins of the wire with the sharp angle desired. Thus a strip 121 is welded on the upper side of the screen at the outer margin thereof, and an angle strip 123 is welded on the lower side of the screen on the inner margin thereof with one leg of the angle strip extending downwardly. In use, the angle strip 123 will fit around the associated edge bar 59 and the downwardly extending leg of the angle strip will project into the channel 47. The bent margin 103 of the tensioning plate 101 will engage the outer strip 121 to apply a pulling force against the outer strip and thus tension the screen.

It will be appreciated that each section of the screen of the present invention may be individually tensioned without worrying about keeping the screen centered. It will be also appreciated that the screen cloth of the present invention is fully supported regardless of the space size.

Installation of screen sections of the present invention is also easier because usual chutes at the discharge end of the piece of equipment do not need to be taken completely away, since the lower deck screens can be slid in at an angle and then turned into place.

Another advantage of the narrower screen sections provided by the present invention is that such sections are easier to carry and handle. When a wide expanse of screen is utilized, the screen must be placed under extra tension in order to hold the screen against the strain of reversing cycles, especially where no center strip of any kind is used. This means that normally the wire gauge must be sufficiently large to withstand this strain, or else there is a risk of splitting the screen. With the present invention, the narrower screens may be placed under less tension to hold them in place, thus making it possible to use finer wire to attain a greater effective screening area.

If the need arises, full width cloth can be used if desired by using a flat hold-down strip at the center instead of a hold-down plate 71. It is further pointed out that two different sizes of minus material can be made at the same time on the bottom deck by using different opening wire on each side and partitioning the fall through apart.

The T-shaped side rails 41 permit the use of the rubber crown channel in the same manner as in the intermediate support rails. This rubber crown channel at the side permits the crimp of the wires to crush into it and thereby permits drawing the slack out of the screen cloth. With steel side angles, the crimp of the wires often binds against the steel and sometimes prevents drawing out the slack.

The space between the rubber crowns and the side plates of the screen box permits small rocks that get behind the screen edges to roll on down and out through slots or openings 130 (FIG. 2) that are cut in the horizontal portion of each T-shaped side rail for this purpose. In order that small rocks that get behind the screen edges and fall down into the channels be able to roll along the channels (provided by the walls 9 and the members 41 and the strips 53) it is evident that the depth of the channels must be greater than the distance between the outer margins of the screens and the walls 9 as is shown in FIG. 2.

FIG. 7 shows a modified form of bolt 73*a* having a T-shaped head 74*a* fitting in a slot 201 in an angle lug 203 welded to the bottom of the channel 47. The upper end of the bolt is slotted at 205 to receive a wedge 207 to force the plate 71 downwardly to clamp the screen edges in place. A safety wire or cotter pin 209 is provided in the wedge for obvious purposes. A slot 210 is formed in the lug to enable the head 74*a* to pass downwardly through the lug to enable the bolt to be removed.

In FIG. 8, the bolt 73*b* has a head 211 above the plate 71, and has its lower end slotted at 213 to receive a wedge 215. This construction enables the center deck screens to be changed without removing the top screens. A safety wire 217 may be provided.

While the type of inner screen edge hold-down arrangement shown in FIG. 2 is ideal where access to the underside of the screen is limited or negligible, and while such arrangement is also suitable where adequate access is available, the form of the invention shown in FIG. 9 can be used under the latter conditions. In this form of the invention, there is a channel 47*c* having flange portions 57*c* equipped with edge bars 59*c* tack welded in place. The inner margins of the screens 61*c* and 63*c* hook over the bars 59*c*.

To clamp such inner margins against the bars, there is a clamping structure comprising a flat elongated plate 71*c* having a plurality of longitudinally spaced depending stud bolts 73*c* depending from and fixedly secured to the plate 71*c* and passing through matching holes in the web of the channel 47*c*. Nuts 79*c* thread on the lower ends of the stud bolts to clamp the plate 71*c* against the inner margins of the screens 61*c* and 63*c*.

Having described the invention in what is considered to be the preferred embodiment thereof, it is desired that

it be understood that the invention is not to be limited other than by the provisions of the following claims.

I claim:

1. In a vibrating screen apparatus, screening means on which the material to be screened is deposited, a supporting structure for said screening means, said screening means including at least two juxtaposed screen members extending longitudinally of the supporting structure and having inner margins adjacent one another, said screen members being inclined to cause material thereon to travel in a direction parallel to said inner margins, each screening member being flexible and capable of being tensioned to assume a taut form, means for securing the inner margins of the screen members in place, said supporting structure including channel providing means adjacent the outer margins of said screen members providing upwardly facing channels defined by inner, outer and bottom walls and being inclined similar to the screen members, and means engaging said outer screen margins and forcing said outer screen margins downwardly against the edges of said inner channel walls and drawing said outer margins outwardly and over the inner walls of said channels and beyond said inner walls but short of said outer walls by a distance less than the depth of said channels so that any particles that pass downwardly through the spaces between said outer screen margins and said outer channel walls will be smaller than the recesses provided by said channels so that such particles will be free to gravitate along said channels, said channel providing means including an elastomer crown strip at the upper edge of each inner channel wall whereby the apices of the screen wire at the lower side of the screen members indent into said elastomer strips and rub thereacross to avoid hang up of such apices on the edges of said inner channel walls to thereby avoid insufficient tensioning of said screen members.

2. In a vibrating screen apparatus, a screen deck including a frame supporting a screening means on which the material to be screened is deposited, said screening means including at least two juxtaposed sections of screen each extending longitudinally of the deck frame substantially coextensively therewith, said sections having downwardly projecting portions on the inner margins thereof, an elongate longitudinally extending member disposed below the level of the screen section and fixedly secured at least at its ends and several intermediate points to said frame and providing an upwardly facing longitudinal groove, said portions projecting downwardly into said groove, clamping means engaging the top surfaces of said margins and being connected to said member at a plurality of places including at least several places intermediate the ends of said member for clamping said margins against portions of said member adjacent said groove, and means connected to each of the outer margins of the sections and applying tension to said sections independently of one another.

3. In a vibrating screen apparatus, a screen deck including a frame supporting a screening means on which the material to be screened is deposited, said screening means including at least two juxtaposed sections of screen each extending longitudinally of the deck frame substantially coextensively therewith, said sections having downwardly projecting portions on the inner margins thereof, an elongate longitudinally extending member disposed below the level of the screen section and fixedly secured at least at its ends and several intermediate points to said frame and providing an upwardly facing longitudinal groove, said portions projecting downwardly into said groove, clamping means engaging the top surfaces of said margins and being connected to said member at a plurality of places including at least several places intermediate the ends of said member for clamping said margins against portions of said member adjacent said groove, and means for securing the outer margins of the sections to said frame, said portions of said member comprising replaceable rods tack or skip welded to the remainder of said member.

4. In a vibrating screen apparatus, a screen deck including a frame supporting a screening means on which the material to be screened is deposited, said screening means including at least two juxtaposed sections of screen each extending longitudinally of the deck frame substantially coextensive therewith, said sections having downwardly projecting portions on the inner margins thereof, an elongate longitudinally extending member providing a longitudinal groove, said screen sections being inclined in a direction parallel to said elongate longitudinally extending member so that the direction of feed is parallel to said member, said portions projecting into said groove, a clamp element extending longitudinally of said member and disposed above and bearing down on said margins, said clamp element comprising a flat plate which facilitates lateral movement thereover of material from one screen section to the other, the upper surface of said plate being at a level not substantially higher than that of said screen sections, and bolt means distributed along the length of said plate and at least at several places intermediate the length of said plate for securing said plate to said member.

5. In a vibrating screen apparatus, screening means, open framework supporting structure beneath said screening means for supporting said screening means while permitting material which falls through said screening means to pass through said supporting structure, said screening means including at least two juxtaposed screen members, said supporting structure including a pair of adjacent parallel elements fixedly disposed in parallel relation to the inner margins of said screen members and being anchored to the remainder of said supporting structure at a plurality of places distributed along the length thereof with at least some of such places being disposed intermediate the ends of said elements, the inner margins of said screen members extending downwardly and hooking around said pair of elements, clamping means including a clamping structure disposed above said screen members and in engagement with said inner margins, said clamping means including devices connecting said clamping structure to said supporting structure at a plurality of places along the length of said supporting structure and at least at several places intermediate the length of said inner margins to clamp said inner margins down against said pair of elements to retain said margins in place, said screen members being inclined in a direction such that the direction of feed of material being screened is parallel to said elements, and means for securing the outer margins of said screen members to said supporting structure in a manner to tension said screen members, said clamping structure being flat and thin relative to the material being handled for at least a major portion of the length thereof and for such major portion having its upper surface at approximately the same level as that of the upper surface of said screen members so that lateral movement thereover of such material from one screen member to the other is facilitated.

6. In a vibrating screen apparatus, screening means on which the material to be screened is deposited, a supporting structure for said screening means, said screening means including at least two juxtaposed screen members extending longitudinally of the supporting structure and having inner margins adjacent one another, said screen members being inclined to cause material thereon to travel in a direction parallel to said inner margins, each screening member being flexible and capable of being tensioned to assume a taut form, means for securing the inner margins of the screen members in place, said supporting structure including means adjacent the outer margins of said screen members providing upwardly facing channels defined by inner, outer and bottom walls and

being inclined similar to the screen members, and means engaging said outer screen margins and forcing said outer screen margins downwardly against the edges of said inner channel walls and drawing said outer margins outwardly and over the inner walls of said channels and beyond said inner walls but short of said outer walls by a distance less than the depth of said channels so that any particles that pass downwardly through the spaces between said outer screen margins and said outer channel walls will be smaller than the recesses provided by said channels so that such particles will be free to gravitate along said channels, the bottom walls of said channels having openings formed therein for the discharge therefrom of particles gravitating along said channels.

7. In a vibrating screen apparatus, a screen deck including a frame supporting a screening means on which the material to be screened is deposited, said screening means including at least two juxtaposed sections of screen each extending longitudinally of the deck frame substantially coextensively therewith, said sections having downwardly projecting portions on the inner margins thereof, an elongate longitudinally extending member providing a longitudinal groove, said portions projecting into said groove, a clamp element extending longitudinally of said member and bearing down on said margins, said clamp element comprising a flat plate which facilitates lateral movement thereover of material from one screen section to the other, and bolts securing said plate to said member, said bolts extending upwardly through holes in said member and said plate, means on the upper ends of said bolts for drawing said bolts upwardly, said bolts having non-circular heads beneath said member, said holes in said member being non-circular and of a size and shape to pass said heads, in at least one position of said heads relative to said holes but not to pass said heads in at least one other position of said heads relative to said holes to enable ready removal and insertion of said bolts by operations carried out above said screen sections.

8. In a vibrating screen apparatus, a screen deck including a frame supporting a screening means on which the material to be screened is deposited, said screening means including at least two juxtaposed sections of screen each extending longitudinally of the deck frame substantially coextensively therewith, said sections having downwardly projecting portions on the inner margins thereof, an elongate longitudinally extending member providing a longitudinal groove, said portions projecting into said groove, a clamp element extending longitudinally of said member and bearing down on said margins, said clamp element comprising a flat plate which facilitates lateral movement thereover of material from one screen section to the other, and bolts securing said plate to said member, said bolts extending upwardly through said member and said plate and having transversely elongated heads beneath said member, said member having elongate slots of a size and shape to pass said heads when the heads are aligned with said slots, said slots and heads being misaligned but being capable of being aligned for ready removal of said bolts, stop means preventing turning movement of the heads one way but permitting limited turning movement the opposite way, said heads being disposed against said stop means, said stop means being positioned so that when the heads are thereagainst the heads are misaligned with relation to said slots.

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