SCREEN PANEL

FIELD OF THE INVENTION

The present invention in general relates to screening panel for screening / separating or grading of minerals in the mining and quarrying industries and in particular to screen panels equipped with replaceable wearing/functional sections.

BACKGROUND OF THE INVENTION

Screening panel system for ore screening decks that is now widely used by the mining industry, replaced the earlier screening cloths and large wire screening frames. These screening panels are known to be either of Rubber or Polyurethane with steel reinforcements. It is also known that such panels are manufactured by hot vulcanized method or casting. The panels are adapted to be secured with the support frame of the screen machine by bolting. The panels may also be secured to the frame with an alternate method using a pin and separate lug arrangement.

A difficulty encountered in using these panels is that the whole panel needs to be replaced with a minimum defect in the aperture zone due to cutting of aperture or wearing of aperture where screening area thickness is reduced. This affects the strength of apertured area of the panel and also the cut point. In a screen panel the edges are thicker than the screening portion as in the edges, the internal reinforcements are placed which needs to be wear protected. However, the main wear portion is the screening area thickness i.e in the aperture zone which is the functional zone. Conventionally the functional zone and the reinforcement zone are homogeneous and one piece. Hence, at the time of replacement of panels the customer has to change the entire panel i.e the functional zone or wear zone and the reinforcement zone being one , homogeneous and integral. Further, the integral nature of the screen panels add on to the overall weight triggering, handling inconveniences.

Accordingly there was a long felt need to design improved screen panels for its application in mining and quarrying industries, which have replaceable

wearing/functional sections and which are light weight, easy to handle and have substantially low manufacturing cost.

The present invention meets the aforesaid long felt need.

All through out the specification including the claims, the words "screen panel", "mining", "quarrying", "mineral", "ores", "abrasion resistant", "wear resistant", "sections", "zones", "wear zone/section", "reinforcement zone/section" are to be interpreted in the broadest sense of the respective terms and includes all similar items in the field known by other terms, as may be clear to persons skilled in the art. Restriction/limitation, if any, referred to in the specification, is solely by way of example and understanding the present invention.

OBJECTS OF THE INVENTION

It is the principal object of the present invention to provide a screen panel with replaceable wearing/functional sections for its application in mining and quarrying industries.

It is a further object of the present invention to provide a screen panel with replaceable wearing/functional sections having higher longevity and which is flexible.

It is a further object of the present invention to provide a screen panel with replaceable wearing/functional sections having light weight and consequently, is easy to handle.

It is yet another object of the present invention to provide a screen panel with replaceable wearing/functional sections which have a substantially low cost of manufacturing.

It is a further object of the present invention to provide a screen panel with replaceable wearing/functional sections which ensures easy fitting of the panels and substantially reduces the spares cost.

It is another object of the present invention to provide a screen panel with replaceable wearing/functional sections which ensures prevention of clogging of materials during screening.

It is another object of the present invention to provide a method for manufacturing a screen panel with replaceable wearing/functional sections for its application in mining and quarrying industries.

How the foregoing objects are achieved and the other aspects of the present invention, will be clear from the following description which is purely by way of understanding and not by way of any sort of limitation.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a screen panel for mining and quarrying industries adapted to be mounted on a screen deck including a wear section and a reinforcement section, said wear section comprising a screening surface made up of materials such as herein described formed on said reinforcement section such as herein described, said wear section being the top portion of said panel and said reinforcement section being the bottom portion of said panel, said wear section and said reinforcement section being separate units and said wear section being adapted to be replaceable from time to time, for ensuring smooth functioning of screening operation.

In accordance with preferred embodiments of the screen panel of the present invention:

-said screening area comprises abrasion resistant apertures having a flaring design;

-said wear section is separated into two or more units;

-said wear section and said reinforcing section are adapted to be attached to each other by button type snug fitting or by pin and lug arrangement or by bolting;

-said wear section is made up of polyurethane/rubber/steel and said reinforcement section is a frame made by hot vulcanizing or casting with rubber or polyurethane;

-said screening surface is made of any one of or a combination of mild steel, stainless steel, rubber and/or polyurethane with or without steel reinforcing;

-said panel comprises of vulcanized material, rubber polyurethane, having embedded within it steel reinforcing bars, at the outer edges of said panel and extended across the inner area of said panel, thereby providing support to said screening surface;

-the reinforcement section of said panel is fitted to the machine frame by button type snug fitting or by pin and lug arrangement or by bolting.

The present invention also provides a method of manufacturing a screen panel for mining and quarrying industries adapted to be mounted on a screen deck, including designing a wear section having a screening surface made up of materials such as herein described and a reinforcement section such as herein described and forming the wear section on said reinforcing section, said method further including making the said wear zone and said reinforcement zone as separate units such that, said wear section is replaceable from time to time, for ensuring smooth functioning of screening operation.

The present invention also provides a screening deck for mining and quarrying industries, having mounted thereon a plurality of screen panels , each said panel including a wear section and a reinforcement section, said wear section comprising a screening surface made up of materials such as herein described formed on said reinforcement section such as herein described, said wear section being the top portion of said panel and said reinforcement section being the bottom portion of said panel, said wear section and said reinforcement section being separate units and said wear section being adapted to be replaceable from time to time, for ensuring smooth functioning of screening operation.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The nature and scope of the present invention, will be better understood from the accompanying drawings, which are by way of illustration of some preferred embodiments and not by way of any sort of limitation. In the accompanying drawings,

Figure 1 illustrates a plan view of the screening surface in accordance with a preferred embodiment of the present invention.

Figure 2 illustrates a sectional view of the screening surface in Figure 1 along the line A-A.

Figure 3 illustrates an enlarged plan view of a preferred embodiment of the screening surface in accordance with the present invention and a sectional view of the same along the line A-A.

Figure 4(a) illustrates a pictorial view of the screening area according to a preferred embodiment of the present invention.

Figure 4(b) illustrates a sectional view of the screening surface in Figure 4(a) along the line A-A.

Figure 5 illustrates how the reinforcing section and the wearing/functional section are fitted according to a preferred embodiment of the present invention.

Figure 6(a) illustrates a plan view of a conventional screen panel.

Figure 6(b) illustrates an enlarged sectional view of the panel in Figure 6(a) along the line A-A.

Figure 7(a) illustrates a plan view of the screen panel according to a preferred embodiment of the invention.

Figure 7(b) illustrates an enlarged sectional view of the screen panel in figure 7(a) along the line B-B.

Figure 7 (c) illustrates an enlarged sectional view of the screen panel in figure 7(a) along the line A-A.

Figure 8(a) illustrates a plan view of the screen panel according to another preferred embodiment of the present invention.

Figure 8(b) illustrates an enlarged sectional view of the screen panel in figure 8(a) along the line A-A.

Figure 9 illustrates a plan view of the screen panel according to a further preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The following describes some preferred embodiments of the present invention, which are purely for the sake of understanding the performance of the invention, and not by way of any sort of limitation.

It is traditionally known that screen panels basically comprise a wear/functional section and a reinforcement section. These sections are also commonly referred to as wear zones and reinforcement zones in the art of screening in mining and quarrying industries. The wear zones include screening surface/area with abrasion resistant apertures. The reinforcement zone comprises the reinforcement frame, which is eventually mounted on the machine frame. Traditionally, the functional zones and reinforcement zones are homogeneous and integral with one another or in other words, are made in one piece. Thus, after some time when the apertures get weared due to abrasion, the whole screen panel has to be changed, which renders the entire operation costly and inconvenient.

The present invention aims at the innovative step of separating the functional zone from the reinforcement zone, thus allowing the non wearing reinforcement zone to remain as it is and reusable, whereas the functional zone is changed from the top whenever it wears off. So, the customer replaces only the top portion of the panel

and hence obviously the total cost reduces and the whole screening operation becomes very convenient. Also, this reduces the overall weight of the panels. Thus, the present invention provides screen panels with replaceable functional zones , for its application in mining and quarrying industries.

Ideally, the screening surface is made of any one of or a combination of mild steel, stainless steel, rubber and/or polyurethane with or without steel reinforcing.

The comprehensive panel preferably comprises of vulcanized material, rubber polyurethane, having embedded within it steel reinforcing bars, at the outer edges of said panel and extended across the inner area of said panel, thereby providing support to said screening surface.

The accompanying figure 1 illustrates a plan view of the screening surface according to a preferred embodiment of the present invention. It shows the panel fixing frame 1′, that is bolted/welded to the frame under the screen deck.

The accompanying figure 2 illustrates a side view of the screening surface illustrated in the figure 1.

The screening panels according to the present invention may be either of rubber or polyurethane with steel reinforcements. The bottom part or frame of the panel is manufactured by hot vulcanizing or casting with rubber or polyurethane.

The accompanying figure 3 illustrates a pictorial view of the screening area according to the present invention, which is the functional/wear section of the panel and is replaceable. It shows a screening area made of polyurethane/rubber/steel . Figure 3 also shows a sectional view along the line A-A.

The accompanying figure 4(a) shows the screening area shown in figure 3 together with the frame, the frame being the reinforcing section and is non-replaceable.

The accompanying figure 4(b) shows a sectional view of the panel shown in figure 4(a) along the line A-A.

The accompanying figure 5 illustrates the technology by which the screen panel with replaceable wear/functional section according to the present invention, is fixed to the frame of the machine. The fixing may be done by the button type snug fitting applying the fixing means, as protected by patent number 231453 of the applicant. The replaceable functional section may be fitted to the non-replaceable reinforcing section of the screen panel, according to the present invention, applying the same technology. For that purpose, button type male portion has to be provided on the top functional part, while the corresponding female part has to be in the reinforcement zone. Other type of fixing arrangements are also embraced by the present invention, as explained hereinafter.

The accompanying figure 6(a) illustrates a plan view of a conventional screen panel having the wear zone integrated to the reinforcement zone and made in one piece. This is particularly clear from the sectional view in the accompanying figure 6(b) taken along the line A-A in figure 6(a). It shows the reinforcement zone(1) and the wear zone(2) integral to each other. On the contrary, the accompanying figure 7(a) illustrates a plan view of the screen panel according to the present invention, where the top wear zone(2) and the bottom reinforcement zone(1) constitute separate parts. This is particularly clear from the sectional view in the accompanying figure 7(b) taken along the line B-B in figure 7(a). It clearly shows that the wear zone(2) and the reinforcement zone(1) are separated. It also illustrates that by snug type fixing as described in the preceding paragraph, the reinforcement section(1) is fixed onto the frame/angle(3). The accompanying figure 7(c) illustrates a sectional view along the line A-A in figure 7(a). It illustrates how the two separated portions, namely the top and replaceable wear zone(2) is fixed to the bottom reinforcement zone(1) by snug type fixing arrangement(4), as detailed in the last four lines of the preceding paragraph. The top/wear part is provided with the snug type fixing(4), that fits into the cavity in the bottom/reinforcement part. Preferably, the wear zone has a thickness of 18mm and the reinforcement zone has a thickness of 22mm.

Now, instead of snug fitting type of arrangement, there may be pin and lug type fixing arrangement for fixing the two portions of the panel and for fitting the panel on to the machine frame. Alternatively, there may be bolt type of fixing arrangement.

The accompanying figure 8(a) shows a plan view of a screen panel according to the present invention, having a replaceable top/wear part and a fixed, bottom/reinforcement part where the two parts are fixed by pin and separate lug arrangement. This would be particularly clear from the sectional view in the accompanying figure 8(b), taken along the line A-A in figure 8(a). It illustrates pin and lug fixing arrangement for fixing the top/wear zone(2) to the bottom/reinforcement zone(1). Preferably, the thickness of the wear zone is 10 mm and the thickness of the reinforcement zone is 30mm and more preferably 22mm.

The accompanying figure 9 illustrates a further preferred embodiment where the top/replaceable wear zone is divided into a top left part(5) and a top right part(6). Thus, the screen panel comprises three portions, top left part, top right part and the bottom reinforcement part. The top part of course, may be broken into three or more parts as well. So, in this way the screen panel according to the present invention may be divided into several modular parts each of which can be replaced from top, for convenient, smooth and perfect screening operation, which is economic as well. Although the fitting arrangement between the top portion and the bottom portion has been shown in the accompanying figure 9 , as snug fitting type as discussed hereinabove, it should be understood that all possible fixing arrangements are possible.

In all the various preferred embodiments of the present invention, as described hereinbefore, the apertures of the removable screening area preferably has flaring design, for prevention of clogging of materials during screening operation.

The method of manufacturing a screen panel according to the present invention includes designing a wear section having a screening surface made up of materials such as herein described and a reinforcement section such as herein described and forming the wear section on said reinforcing section. The method further includes making the wear zone and the reinforcement zone as separate units such that, the wear section is replaceable from time to time, for ensuring smooth functioning of screening operation.

In a nutshell, the non-limiting advantages of the screen panel according to the present invention may be summarized as below:

1.The requirement for replacing the whole panel is done away with, thereby reducing the cost of operation and manufacturing of screen panels.

2. The screen panels are made light weight by making the top portion replaceable either in totality or in part.

3. The flaring design of the screening apertures, ensure prevention of clogging during screening operation.

4. Easy fitting of the panel to the machine frame and easy fitting between the top and bottom portion are ensured.

5. Flexibility and higher longevity are ensured.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

The present invention has been described with reference to some drawings and preferred embodiments, purely for the sake of understanding and not by way of any limitation and the present invention includes all legitimate developments within the scope of what has been described hereinbefore and claimed in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A screen panel for mining and quarrying industries adapted to be mounted on a screen deck including a wear section and a reinforcement section, said wear section comprising a screening surface made up of materials such as herein described formed on said reinforcement section such as herein described, said wear section being the top portion of said panel and said reinforcement section being the bottom portion of said panel, said wear section and said reinforcement section being separate units and said wear section being adapted to be replaceable from time to time, the reinforcement section having a button type snug fitting for removably fitting the reinforcement section to a machine frame of the screen deck for its replacement from time to time, thereby ensuring smooth functioning of screening operation.

2. The screen panel of claim 1, wherein said screening area comprises abrasion resistant apertures having a flaring design, wherein a cross-sectional area of the aperture is smaller at the upper surface of the wear section than at the lower surface of the wear section.

3. The screen panel of claim 1, wherein said wear section is separated into two or more units.

4. The screen panel of claim 3 wherein said wear section and said reinforcing section are adapted to be attached to each other by button type snug fitting.

5. The screen panel of any one of claims 1 to 4, wherein said wear section is made up of polyurethane/rubber/steel and said reinforcement section is a frame made by hot vulcanizing or casting with rubber or polyurethane.

6. The screen panel of claim 1, wherein said screening surface is made of any one of or a combination of mild steel, stainless steel, rubber and/or polyurethane with or without steel reinforcing.

7. The screen panel of claim 6, wherein said panel comprises of vulcanized material and/or rubber polyurethane, having embedded within it steel reinforcing bars, at the outer edges of said panel and extended across the inner area of said panel, thereby providing support to said screening surface.

8. A method of manufacturing a screen panel for mining and quarrying industries adapted to be mounted on a screen deck, including forming a wear section having a screening surface made up of materials such as herein described and a reinforcement section such as herein described and forming the wear section on said reinforcing section, said method further including making the said wear section and said reinforcement section as separate units such that, said wear section is replaceable from time to time, and forming a button type snug fitting in said reinforcement section for fitting the reinforcement section to a machine frame of the screen deck for its replacement from time to time, thereby ensuring smooth functioning of screening operation.

9. A screening deck for mining and quarrying industries, having mounted thereon a plurality of screen panels, each panel including a wear section and a reinforcement section, said wear section comprising a screening surface made up of materials such as herein described formed on said reinforcement section such as herein described, said wear section being the top portion of said panel and said reinforcement section being the bottom portion of said panel, said wear section and said reinforcement section being separate units and said wear section being adapted to be replaceable from time to time, said reinforcement section of said panel having a button type snug fitting coupling the reinforcement section to a machine frame of the screening deck for its replacement from time to time, thereby ensuring smooth functioning of screening operation.

10. A screen panel of claim 1, wherein the wear section has button type snug fittings formed in each corner of the wear section and the reinforcement section has a plurality of uniformly spaced button type snug fittings formed along its length for removably coupling the wear section to the reinforcement section without separating the reinforcement section from the machine frame.

11. A screen panel of claim 10, wherein a greater number of button type snug fittings couple the wear section to the reinforcement section than couple the reinforcement section to the machine frame.

12. A screen panel of claim 10, wherein the reinforcement section has button type snug fittings formed in its upper surface for coupling to the wear section and button snug fittings formed in its lower surface for coupling to the machine frame of the screen deck.

13. A screen panel of any one of claims 1 to 12, substantially as hereinbefore described with reference to the figures and/or examples.