June 6, 1950 E. L. COON 2,510,741

BRUSH FOR USE WITH VIBRATING SCREENS

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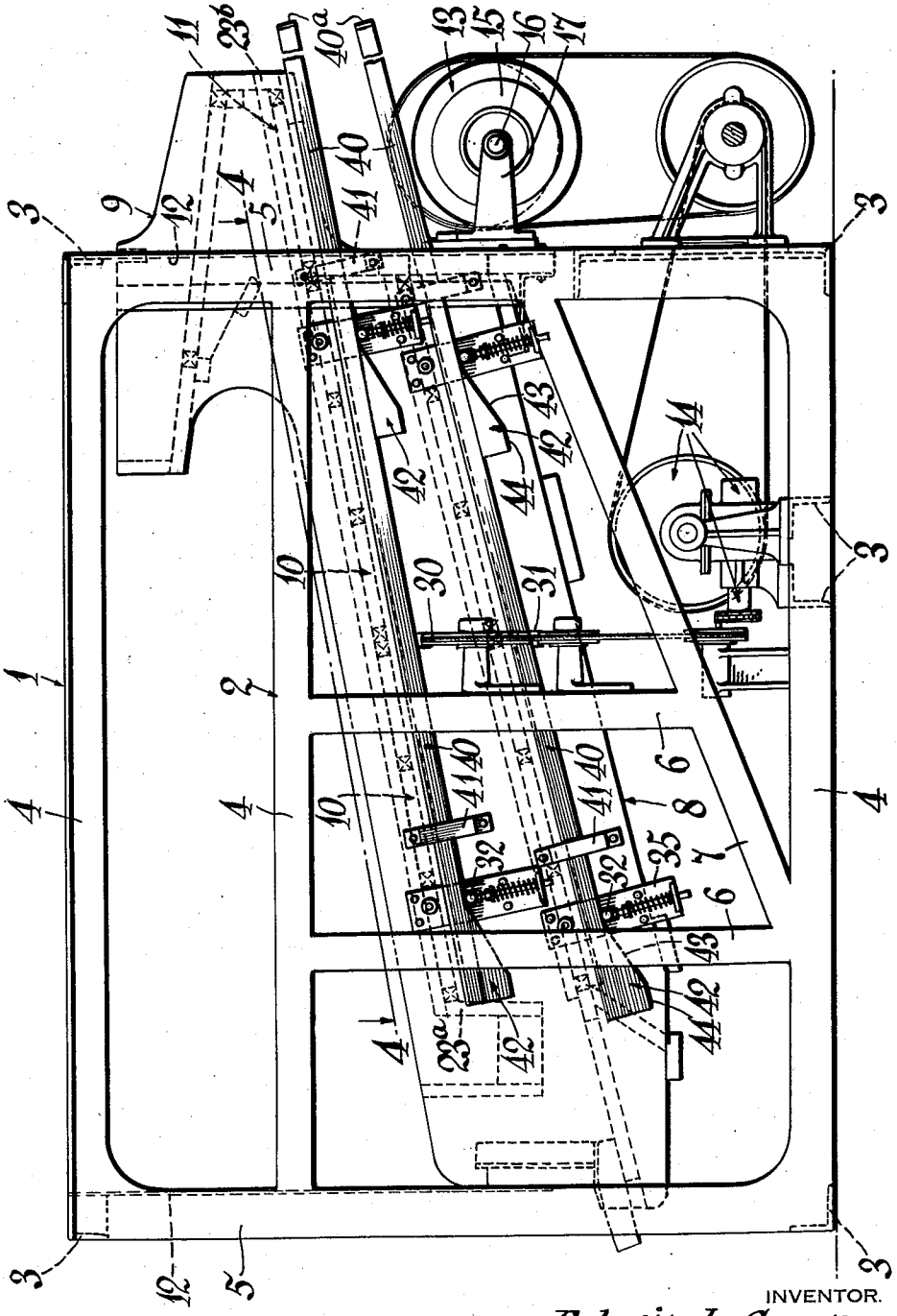


Fig. 1.

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Fig. 2.

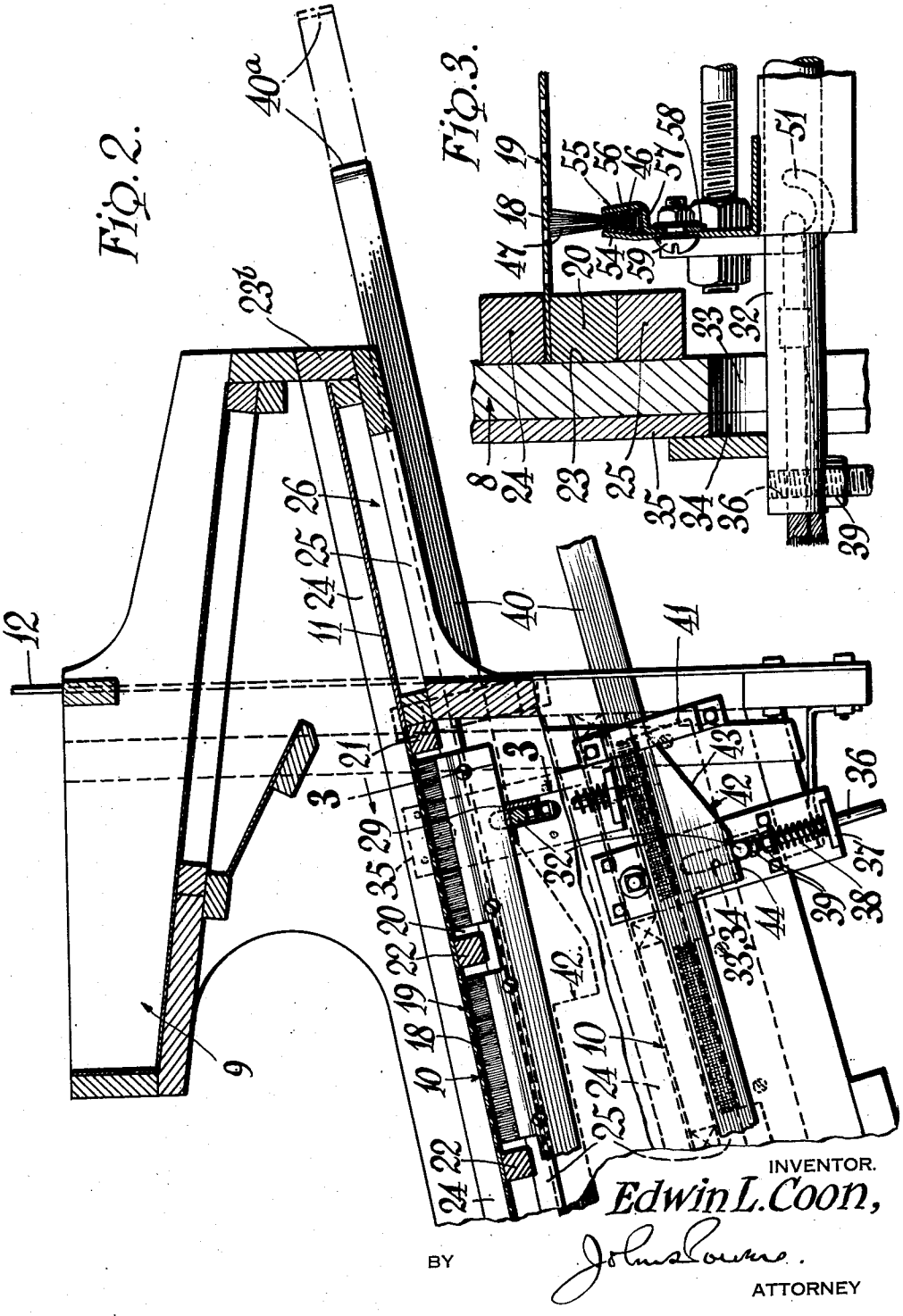


Fig. 3.

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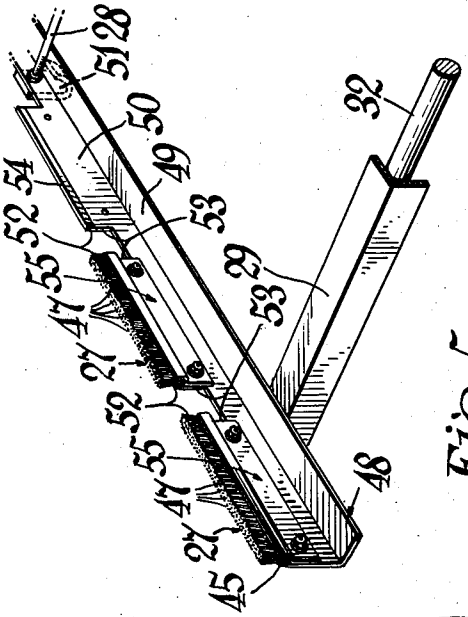


FIG. 5.

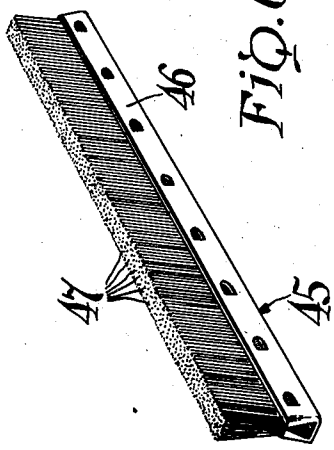


FIG. 6.

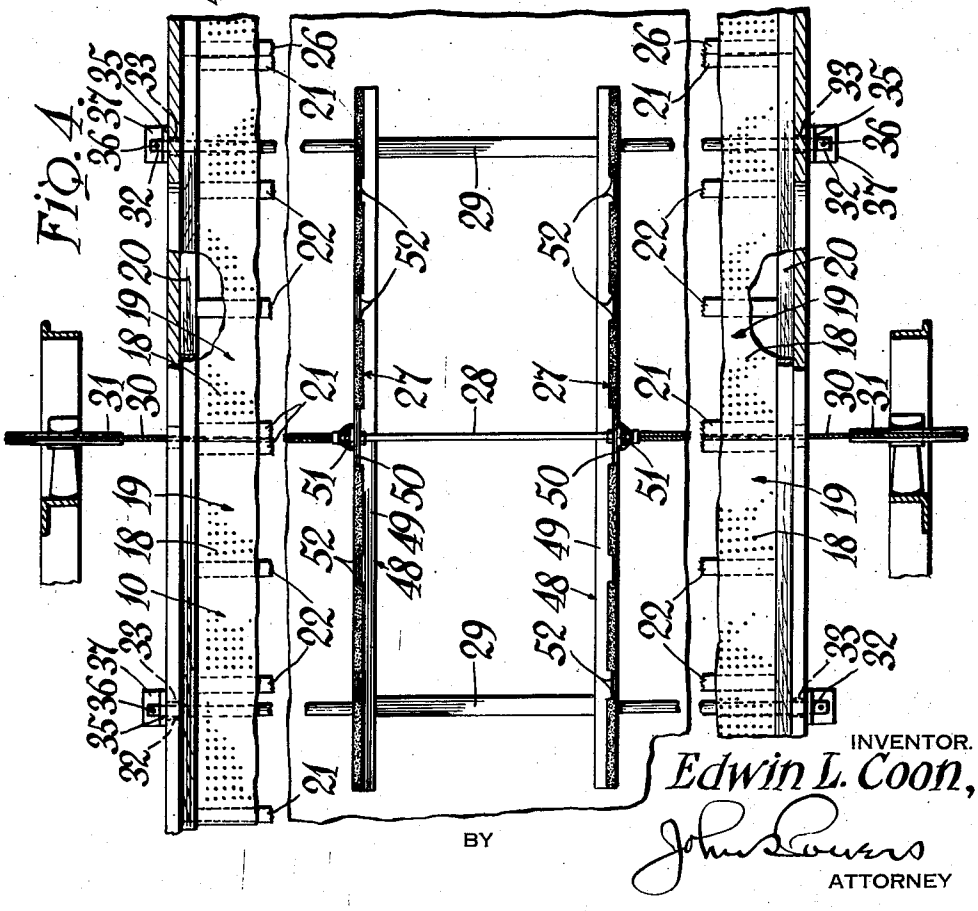


FIG. 4.

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UNITED STATES PATENT OFFICE

2,510,741

BRUSH FOR USE WITH VIBRATING SCREENS

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Application February 9, 1949, Serial No. 75,477

7 Claims. (Cl. 209—388)

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This invention relates generally to vibrating screens of the type wherein brushes are arranged under and in contact with each screen unit and are reciprocated relatively to the screen unit or units in order at all times to maintain the meshes open and clear, thereby to avoid "blinding" at any one or more points and insure efficiency of the screening operation. Screens of this type are principally used in the processing of cereal grains and other seeds, for example, oats, barley, buckwheat, corn, wheat and beans of various kinds, for the purpose of cleaning or cleaning and grading.

The brushes are of the so-called "strip" type, i. e. wherein the bristles are mounted on bars or strips commensurate in length with the screens, the brushes being reciprocated in directions transverse to the directions of reciprocation of the screen units. Each screen unit consists of a frame which carries the screening element and which includes end and intermediate cross bars, the frame being preferably made in two or more adjoining panels. The bristles are provided in successive groups, spaced in adjacent relation in order to afford clearances which accommodate the cross bars of the screening units, the bristles thereby being provided in "sections," so to speak. Upward pressure is applied to the bars of the brushes, thereby to maintain the contact of the bristles with the screening elements.

In the constructions heretofore used the upper faces of the bars of the brushes are drilled and the bristles are doubled upon themselves, fitted in the drill holes, and wired to integral continuous brush carrying bars. This manner of mounting the bristles on the bars involves substantial labor and expense. Due to local causes it generally happens that after a period of use some one or more of the bristle sections will become worn to a greater extent than the others, whereby the brushes will not properly perform their function. In such cases, because of the labor involved, it is not economically practical to replace merely the worn bristle section or sections. Instead it is necessary to discard the entire brush and replace it with a new one, a procedure which has the objection of being wasteful and of entailing substantial expense. The brushes are moreover so mounted that they remain stationary during the longitudinal vibration of the screen unit, their reciprocations being transversely of the screen unit. Thus the movement of the bristles relatively to the screen units has both longitudinal and transverse components whereby unduly rapid wear of the bristles takes place.

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The invention relates specifically to improvements in brushes of the strip type and to the mounting of the improved brushes in the screen, the term "brush" comprehending both the bristle sections and their supporting means. The invention consists generally of a brush and a brush mounting having novel features of structure and combination with the objects in view of effecting substantial economy in manufacture, of enabling the economical replacement of any one or more unduly worn bristles sections, thereby eliminating the necessity of discarding the brush and replacing it by a new one, of reducing, i. e. retarding, the wear upon the bristles, and of cooperation with the novel brush lowering and raising mechanism which forms the subject of my co-pending application, Serial No. 75,478 for the purpose of enabling quick, easy and labor saving access to the brushes when repair or renewal is required.

In the accompanying drawings an embodiment of the invention is illustrated in its operative association with sundry elements of the vibrating screen of which it forms a part.

Figure 1 is a side elevation of a vibrating screen in connection with which the invention is employed.

Figure 2 is a view of the upper portion of the screen, partly in side elevation on an enlarged scale and partly in central vertical section on a similar scale.

Figure 3 is a fragmentary cross section on the line 3—3 of Figure 2.

Figure 4 is a view in the plane of the line 4—4 of Figure 1 with the screen unit broken away in order that the upper brushes, embodying the invention, may be shown in plan.

Figure 5 is a perspective view of a portion of a brush embodying the invention and an associated track rod, one of the bristle sections being removed.

Figure 6 is a perspective view of a bristle section of the brush.

In respects other than the features of the invention and sundry structural elements included in the subject of my co-pending application, Serial No. 75,478 the vibrating screen conforms to standard practice. It embodies a main frame, designated generally as 1, which includes vertical side elements designated generally as 2, these being connected together by cross bars 3, conveniently of angle iron section. Each side element 2 includes horizontal bars 4,

vertical end bars 5, intermediate vertical bracing bars 6 and a diagonal bracing bar 7 which extends between the lower horizontal bar 4 and the vertical end bar 5 at that end of the frame where the driving mechanism is mounted.

The screen includes the usual shoe, designated generally as 8, which carries, in accordance with standard practice, the usual scalping element 9 upon which the grains or seeds to be processed are discharged from the usual hopper (not shown) and one or more screen units designated generally as 10, two such units in superposed relation being shown in the drawings. The grains or seeds which pass through the scalping element 9, in accordance with standard practice, are discharged upon an inclined apron 11, whence they gravitate to a screen unit 10 in coplanar relation to the apron.

In accordance with standard practice, the shoe is supported for reciprocation in the general direction of its length, for example, by vertical spring bars 12 pendant from the upper cross bars 3 at each end of the frame 1, the bars 12 being connected at their lower ends to appropriate transverse bars of the shoe. Any suitable mechanism 13 (motor driven by means unnecessary to show in the drawings) for effecting the reciprocation of the shoe 8 may be provided, the mechanism schematically shown conforming substantially to the construction shown in the patent to Roth, No. 1,517,587 of December 2, 1924 (currently known in the industry as the "Buhler" drive) and including a rotatable "gyrating weight" 15 mounted upon a shaft 16 journaled in supporting brackets 17 secured to and projecting forward from parts of the shoe 8 at its front end.

As shown in the drawings, each screen unit 10 conforms to standard practice and consists of a frame which carries the usual screen element 18. With vibrating screens of the usual length for the purposes described, it is preferable, and in accordance with standard practice, that the frame of the screen be composed of separate rectangular panels 19, severally consisting of side bars 20 and end bars 21 (and, optionally, intermediate cross bars 22). Two panels are shown in the drawings (Fig. 1), each of which carries a section of the screen element 18. The screen element sections, of course, are coplanar and in adjoining relation. The frame of the screen unit is supported by the shoe 8 and the side bars 20 of the adjoining panels are fitted in grooves or channels 23 which are provided by upper and lower spaced parallel bars 24 and 25 secured to the side walls of the shoe. The apron 11 is carried by a rectangular frame 26, also supported in the channels 23 in adjoining relation to the panel 19 at the upper or higher end of the screen unit. Cross pieces 23*a* and 23*b* carried by the shoe at the ends of the channels 23 confine the panels 19 and the frame 26 in the channels 23. The upper cross piece 23*b* is removable in order to enable the removal from the channels 23 in successive relation of the frame 26 and the panels 19.

The openings or meshes of the screen elements are kept clean by brushes, designated generally as 27, which are of the so-called strip type. The arrangement and operation of the brushes conform to standard practice in that they are located under, and with their bristles in contact with, the screen elements; they extend longitudinally of the shoe and are substantially coextensive in length with the screen elements; and they are reciprocated at a relatively slow rate (compared to the rate of reciprocation of the shoe) transversely of the screen elements during the longitudinal vibration of the shoe.

In accordance with standard practice, two parallel brushes are provided for each screen element and are connected for movement as a unit by a centrally located tie-rod 28 and end cross bars 29.

The standard means for reciprocating the brushes is sufficiently indicated by the showing of its cables 30, pulleys 31 over which the cables are trained, and the drive pulley and associated gearing 14.

In accordance with the invention the cross bars 29 are so mounted for sliding movement upon track rods 32 and the track rods, in turn, are so mounted relatively to the shoe that the brushes move longitudinally in unison with the shoe, thereby have no longitudinal movement relatively to the screen elements, and, during their movement longitudinally with the shoe, are reciprocated transversely of the screen elements as aforesaid. The track rods 32 project through slots 33 in the side walls of the shoe (Fig. 3) and through alining slots 34 in supporting plates 35 attached to the outer faces of the side wall of the shoe. Thereby the track rods 32 participate in the movements of the shoe. In order that the brushes may move in unison with the shoe the cross bars 29 are so mounted upon the rods 32 that they will participate in the movement of the rods 32 with the shoe. For this purpose the cross bars 29 are preferably of angle iron cross section with their co-planar horizontal flanges extending in relatively opposite directions from their vertical flanges. This relation sufficiently appears from the showing of the cross bars, viewed comparatively, in Figures 2 and 5, respectively.

The end parts of the track rods 32 which project beyond the side walls of the shoe 8 carry depending stems 36 which in each instance extend through an opening in a horizontal bracket 37 at the lower end of the plate 35. The stem 36 serves to center a compression spring 38 which reacts against the bracket 37 and against a nut 39 adjustably mounted upon the stem 36. The springs 38 normally cause the bristles of the brush to bear with suitable pressure against the screen elements 18 and in serving this function compensate for wear of the bristles. Convenient access to the brushes 27 for the purpose of repair or substitution is provided for by longitudinal cam bars 40 at each side of the shoe 8 and which are slidably mounted in brackets 41 secured to the side walls of the shoe. Each cam bar 40 is provided with a pair of downwardly extending cam projections 42, the cam surfaces 43 of which extend from flat or dwell surfaces 44. The cam bars 40 are provided at their outer ends with suitable hand grips 40*a*. In order to gain access to the brushes the corresponding cam bars at opposite sides of the shoe 8 are pulled forward manually. In Figure 1 the cam bars are shown in their normal position. In Figure 2 a cam bar of the upper pair is shown in its normal position and a cam bar of the lower pair is shown in its advanced position. When the cam bars are pulled forward the cam surfaces 43 ride upon the projecting end portions of the track rods 32 and effect the downward movement of the track rods within the slots 33 and 34. The forward movement of the cam bars is continued until the dwell surfaces 44 engage over and upon the track

rods, thereby to maintain them in their lowered positions. When the track rods are lowered the pair of brushes which they support follow them and at the end of the forward movement of the cam bars occupy a correspondingly lowered position. Thereupon one or more of the screen element panels 19, as may be necessary, is removed in order that access may be had to the parts of the brushes which require repair. When the repair has been made the screen element panel or panels is replaced and the cam bars 40 are pushed back to their normal positions, the springs 38 at the same time restoring the brushes to their normal positions wherein the bristles bear with pressure against the screen elements 18.

The brushes 27 include a suitable number of structurally separate or unitary bristle carrying elements 45. These may be of any construction which includes a suitable base or holder 46 for the bristles 47. The elements 45 are preferably of the general construction shown in the patent to Peterson, No. 2,303,386 of December 1, 1942. The bristle carrying elements are lineally straight and may be provided by being cut in sections of suitable length from a continuous elongated strip. The base or holder 46 is preferably of dove-tail cross sectional outline as clearly shown in Figures 3 and 6.

The brushes 27 also include an elongated supporting member 48 for the elements 45 and to which said elements are individually secured in suitably spaced relation. The members 48 extend longitudinally of the screen units and are suitably spaced in parallel relation. Each supporting member 48 is preferably of angle iron cross section and includes a horizontal flange 49 and a vertical flange 50. The horizontal flanges 49 of each pair of associated members 48 rest upon and are secured to the horizontal flanges of a pair of corresponding cross bars 29. The central tie rod 28 for a pair of corresponding brushes is connected to the vertical flanges 50 of the associated members 48 and is utilized to carry the hooks 51 with which the ends of the cables 30 are engaged, the hooks 51 being provided at each end of the tie rod and being at the outer sides of the flanges 50 as shown in Figures 3 and 5.

The spacing of the bristle carrying elements 45 provides between them clearances 52 for the accommodation of the bars 21 and 22 of the screen panel elements 19. The vertical flanges 50 of the supporting members 48 are recessed to provide clearances 53 which aline with and form continuation of the clearances 52. The width of the clearances 52 is such as to provide easy accommodations for bars 21 and 22. The depth of the combined clearances 52—53 is such, in each instance, as to accord with the permissible reduction in the extent of the bristles, due to wear. In other words, progressively with the wear of the bristles, the springs 38 will raise the brushes and the depth of the combined clearances 52—53 is such as to provide for this action.

The attachement of the elements 45 to the flanges 50 is preferably effected by a clamping action and it is for the purpose of such a clamping action that the base or holder 46 is preferably of dovetail cross sectional outline. One member of the clamp is provided by the flange 50 which, for this purpose, has its upper portions 54 (i. e. the portions located between the clearances 53) inwardly inclined at an angle conforming to the inclination of either side wall of the base or holder 46. The other member 55 of the clamp is of general ogee or Z-shaped cross section and consists of a clamping flange 56 opposed to a portion 54 of the flange 50 and inwardly inclined in the opposite direction at an angle conforming to the inclination of either side wall of the base or holder 46, a horizontal base portion 57 upon which the base or holder 46 rests and a depending vertical attachment flange 58 which adjoins and is removably secured to the flange 50 of the supporting member 48 as by bolt and nut fastenings 59. The members 55 are structurally separate from one another, are attached as units to the vertical flange 50, and are lineally coextensive with the portions of the flange 50 between the clearances 53.

In the vibrating screen construction disclosed, and as above pointed out, the brushes have rectilinear movement in unison with the shoe 8 which is rapidly vibrated, that is to say, at a rate of the order of at least four hundred complete reciprocations per minute. Such vibrational speed, of course, results in inherently destructive stresses. It is, therefore, important that the bristle carrying elements and their mounting be such that neither will be impaired by the stresses incident to the vibrational speed of the shoe 8. The clamping construction for the attachment of the elements 45 serves this object and also facilitates the easy, quick and economical repair of the brushes 27.

The attendant in charge of the screen can determine, by observation, when the brushes are not efficiently serving their purposes. As above pointed out, the failure is due to local causes which, after a period of use, adversely affect the operation of some one or more of the bristle sections. Thus, when some one or more of the bristle sections becomes unduly worn, as compared with the remaining bristle sections (as determined by the observation of the attendant), the defective condition can be corrected easily, quickly and economically by lowering the brushes and removing a panel section, or sections, as above described, and then by the detachment from the supporting member 48 (i. e., from its flange 50) of the clamping member, or members 55 corresponding to the element, or elements, 45 which has the unduly worn bristles, the substitution of a new element, or elements 45, and the replacement of the clamping member, or members 55, this repair being effected in one or two minutes, involving merely the disconnection and reconnection of the elements of the fastenings 59, and a minimum cost of the part replaced, i. e., the negligible cost of the new bristle carrying element, or elements, 45.

I claim:

1. In a vibrating screen of the type which includes a vibratory shoe, means for effecting longitudinal vibration of the shoe, a screen unit carried by and vibratory with the shoe and consisting of a frame and a screen element carried thereby, the frame having cross bars, brushes of the strip type extending longitudinally of the screen unit and having bristles which bear with pressure against the underface of the screen element, the brushes being substantially co-extensive in length with the screen element, and means for reciprocating the brushes transversely of the screen element during its longitudinal vibration with the shoe: that improvement in brushes of the strip type which consists of a series of structurally separate, unitary, lineally straight bristle carrying elements arranged in spaced alining relation and each comprising a base or holder and bristles projecting from the base or holder,

the spaces between the bristle carrying elements being dimensioned to provide clearances in which the cross bars of the frame are accommodated; a continuous longitudinal supporting member for the bristle carrying elements formed to provide a clamp member for engagement with one side of each of the holders of the bristle carrying elements; a series of structurally separate, unitary, lineally straight clamp members, one for each of the bristle carrying elements, and each having a clamping flange opposed to the clamping member provided by the supporting member and for engagement with the side of a holder of a bristle carrying element opposite to the side which is engaged by the clamp member provided by the supporting member, a horizontal flange providing a base portion upon which the holder of a bristle carrying element may rest and an attachment flange adjoining the supporting member; and fastenings for the individual detachable connection of the attachment flange of each structurally separate clamp member to the supporting member.

2. A brush of the strip type for use in vibrating screens as set forth in claim 1 wherein the continuous longitudinal supporting member is formed with recesses which aline with and provide continuations of the clearances between the bristle carrying elements and in which the cross bars of the frame are accommodated, and is mounted to participate in the longitudinal vibration of the shoe whereby there is no relative longitudinal movement between the bristles and the screen element.

3. A brush of the strip type for use in vibrating screens as set forth in claim 1 wherein the continuous longitudinal supporting member is of angle iron cross section and has its vertical flange formed with recesses which aline with and provide continuations of the clearances between the bristle carrying elements and in which the cross bars of the frame are accommodated and is mounted to participate in the longitudinal vibration of the shoe whereby there is no relative longitudinal movement between the bristle and the screen element, and wherein the clamp members of the structurally separate series are removably attached to the parts of the vertical flange of the supporting member which extend between the recesses.

4. A brush of the strip type for use in vibrating screens as set forth in claim 1 wherein the continuous longitudinal supporting member is formed with recesses which aline with and provide continuations of the clearances between the bristle carrying elements and in which the cross bars of the screen frame are accommodated, and is supported near its ends by transverse track rods which are movable with the shoe in combination with brush supporting cross bars of angle iron section slidably mounted upon the track rods and connected to the continuous longitudinal supporting member, the horizontal flanges of the brush supporting cross bars extending in relatively opposite directions from their vertical flanges whereby the brushes are moved by the track rods in unison with the shoe and there is no relative longitudinal movement between the bristles and the screen element.

5. A brush unit for use in vibrating screens comprising a pair of brushes, each of the strip type, as set forth in claim 1 and cross bars of angle iron section to which the longitudinal supporting members of the brushes are attached, in combination with transverse track rods provided near the ends of the brushes and mounted for movement with the shoe, the cross bars being slidably mounted on the track rods with their horizontal flanges extending in relatively opposite directions from their vertical flanges whereby the brushes are moved by the track rods in unison with the shoe and there is no relative longitudinal movement between the bristles and the screen element.

6. A brush unit for use in vibrating screens comprising a pair of brushes, each of the strip type as set forth in claim 1, and brush supporting cross bars of angle iron section to which the longitudinal supporting members of the brushes are attached, each supporting member being formed with recesses which aline with and provide continuations of the clearances between the bristle carrying elements and in which the cross bars of the screen frame are accommodated, in combination with transverse track rods provided near the ends of the brushes and mounted for movement with the shoe, the brush supporting cross bars being slidably mounted on the track rods with their horizontal flanges extending in relatively opposite directions from their vertical flanges whereby the brushes are moved by the track rods in unison with the shoe and there is no relative longitudinal movement between the bristles and the screen element.

7. A brush unit for use in vibrating screens comprising a pair of brushes, each of the strip type as set forth in claim 1, and brush supporting cross bars of angle iron section to which the longitudinal supporting members of the brushes are attached, each supporting member being of angle iron section with its vertical flange formed with recesses which aline with and provide continuations of the clearances between the bristle carrying elements and in which the cross bars of the screen frame are accommodated and with its horizontal flange resting upon and attached to the horizontal flanges of the brush supporting cross bars, in combination with transverse track rods provided near the ends of the brushes and mounted for movement with the shoe, the brush supporting cross bars being slidably mounted on the track rods with their horizontal flanges extending in relatively opposite directions from their vertical flanges whereby the brushes are moved by the track rods in unison with the shoe and there is no relative longitudinal movement between the bristles and the screen element.

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