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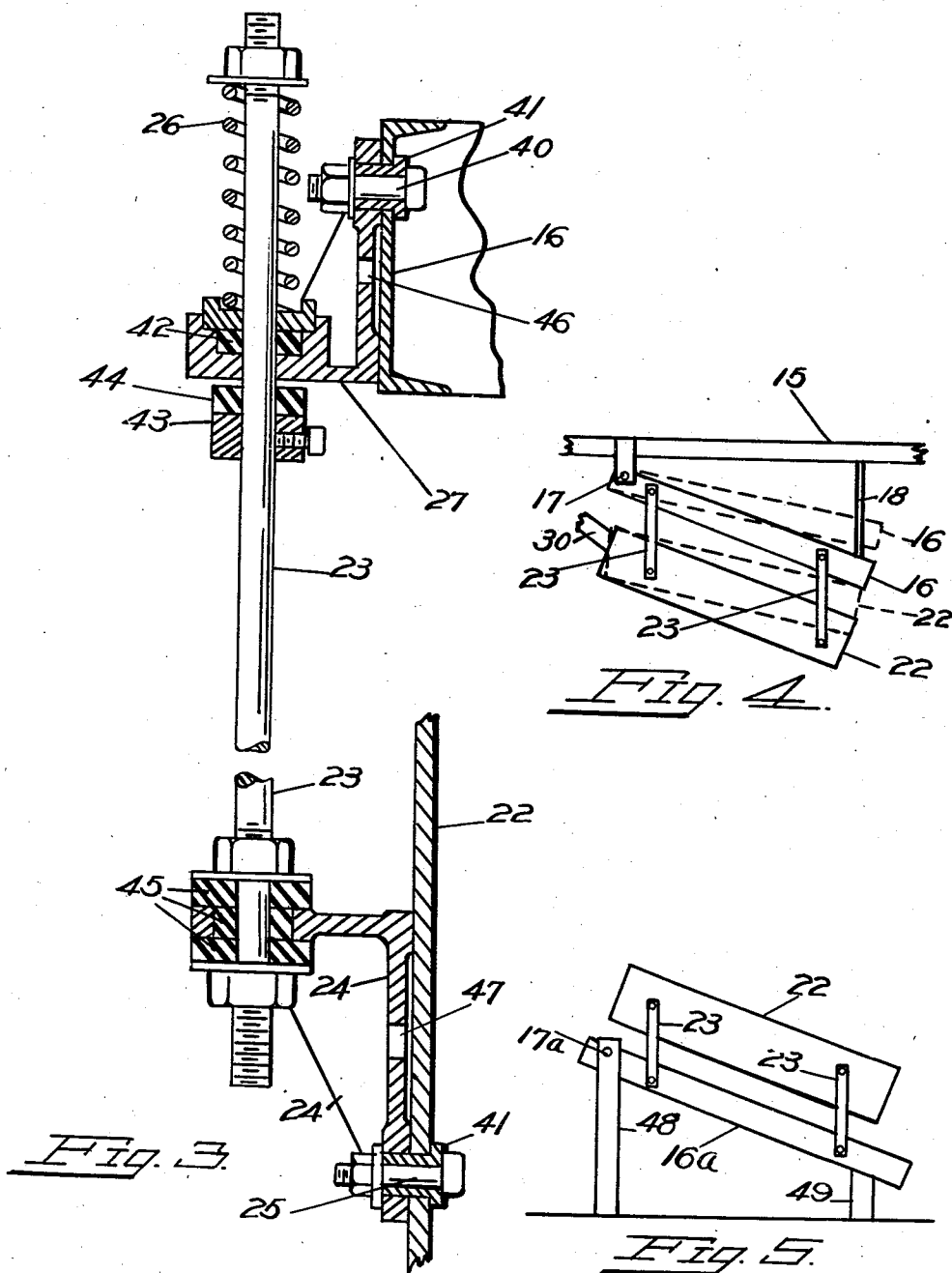
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MEANS FOR CONTROLLING VIBRATORY SCREENS.

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MEANS FOR CONTROLLING VIBRATORY
SCREENS

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This invention relates to an improved means for controlling the operation of vibrating screens and the like.

Vibrating screens are ordinarily mounted at an angle which is inclined from horizontal, the slope of the screen depending upon local conditions such as the nature of the material being screen, the fineness of such material, the results desired, etc.

The optimum angle of inclination of such a vibrating screen can not be predetermined prior to experimental use with the actual material to be screened. Heretofore it has been common practice to install such a screen and make experimental runs of material therethrough. After such experimental runs the angle of inclination of the screen may have to be changed in order to get the desired results with the material at hand. Furthermore, variations in the material being handled or changes in procedure may occur from time to time thus requiring additional changes in the angle of inclination.

Heretofore, a change in the angle of inclination of a vibrating screen has been a rather difficult and laborious job because associated supporting and operating mechanism had to undergo a major alteration. A further and particular objection to such changes after a screen has been installed is that the point of feed of material to the screen has had to be raised or lowered.

Therefore, it is a general object of the present invention to provide a method of controlling the operation of such vibrating screens whereby an optimum angle of inclination may be maintained at all times or may be readily changed at any time, quickly and conveniently and without disturbing the screen supporting mechanism and particularly without changing the elevation of the point of feed to the screen or otherwise altering any associated operating mechanism.

Another object is to provide such a method of screen control whereby the angle of inclination of a vibrating screen may be changed while maintaining the actual operation of the screen which has the improved advantages of eliminating lost time and enabling a user to observe and compare variations in operating results so that optimum conditions may be obtained.

In order to disclose typical mechanism that is well adapted to perform the present method, the accompanying drawings, in which like parts have been similarly designated, will be described in some particularity. In the drawings:

Fig. 1 is a side elevation partially in section of

screening apparatus that is well suited to perform the present method;

Fig. 2 is a sectional view as approximately indicated by the line 2—2 of the Fig. 1;

Fig. 3 is a fragmentary sectional view taken approximately along the line 3—3 of Fig. 1 and drawn to a much larger scale;

Fig. 4 is a diagrammatic illustration of various operating positions of the mechanism illustrated in the Fig. 1; and

Fig. 5 is a diagrammatic illustration of a modified mechanism that is also well suited to perform the present method.

The screening apparatus herein illustrated is an improvement over the disclosure of Patent No. 2,246,483 to Thomas A. Dillon. However said prior patent does not teach the present improved method so that even though the present apparatus is an improvement over said Dillon screen, nevertheless the present method is an entirely new concept. The present improved method is not limited to the specific apparatus herein set forth.

In order to overcome the difficulties and accomplish the objectives hereinbefore referred to, a supporting superstructure 15, Figs. 1 and 2, is provided. This structure may be made of timbers as illustrated or it may be constructed of steel or any other suitable material, or it may even be a portion of the building in which the screen is installed.

A beam element 16 is securely pivoted at one of its ends, to the superstructure 15 as indicated at 17. The other or lower end of the beam element 16 is also supported from the superstructure 15 by means of a wire rope or cable 18 that is held in an eyebolt 19 which depends from said superstructure. The wire rope or cable 18 is also connected with a turnbuckle 20 which is attached to the beam structure 16 as shown at 21. Preferably the lower end beam element support 18—19—20—21 would be duplicated at both sides of the beam element 16. Under some circumstances the screen may be operated substantially level or the discharge end may be somewhat higher than the feed end but usually it is lower as illustrated.

A screen element indicated as a whole by reference character 22 is suspended from the beam element 16 by means of rods 23 the lower ends of which are carried in angle brackets 24 which in turn are pivoted as at 25 to the sides of the screen element 22. The upper ends of the rods 23 are carried in compression springs 26 which in turn are seated in angle brackets 27 that are

pivotally mounted on the sides of the beam element 16. The details of the rods 23 and their mountings and connections are well illustrated in Fig. 3.

Carried in the screen element 22 are a plurality of screens 28 and 29 and a feed chute for the screen element is indicated at 30 having a point of discharge closely associated with the upper screen 28 as shown at 31.

Adjacent the end of the screen element 22 that is opposite from the feed chute 30 are discharge chutes 32 and 33 that are positioned to cooperate respectively with the screens 28 and 29. It will be understood that any number of screens may be employed, two being shown as typical.

A motor 34 is mounted on a pivotal base 35 which is carried upon the beam element 16. Said motor base 35 is urged upwardly by means of compression spring 36 to maintain suitable tension in a V-belt 37 that transmits power from the motor 34 to a driven pulley 38 which in turn operates the mechanism for vibrating the screen inclusive of a balance wheel 39.

The beam element 16 and the screen element 22 are arranged parallel to each other so that they together with the supporting rods 23 form a geometric parallelogram. Furthermore, dimensions A and B Fig. 1 are substantially equal. Dimension A is the distance between a center line passing through the pivotal axis 17 and another center line passing through the axis of pivotal connection of the rods 23 with the beam element 16. Dimension B is the distance between a center line passing through the point of feed 31 and another center line passing through the axis of pivotal connection 25 of the lower ends of rods 23 to the screen element 22. Furthermore, the distances between the pivotal connection of the upper rod 23 to the beam element 16, and the pivotal connection 17 is substantially equal to the distance between the pivotal connection 25 of the upper rod 23 with the screen element 22, and the point of feed 31.

Thus it will be seen that during angular movement of the beam element 16 as effected by operation of the turnbuckle 20 and in any angular position in which said beam element 16 may be placed, the entire assembly, 16-22-23, operates and exists as a parallelogram so that the relationship of the upper end of the screen element 22 does not change to any appreciable extent with reference to the point of feed 31. Furthermore, during such angular movement of the beam element 16 and the screen element 22, the compression spring 36 operates to maintain suitable tension in the drive belt 37.

It is manifest that if a greater change in the angle of the beam element 16 than can be effected by the turnbuckle 20, is desired, then the cable 18 can be taken up or let out through the eyebolt 19 as desired. Furthermore, the supporting cable 18 and its associated components are merely typical and other mechanical means may be provided for supporting the end of the beam element 16 that is opposite its pivotal connection 17.

Next referring to Fig. 3, it will be understood that ordinarily two connecting rods 23 will be used on each side of the beam element 16 and the screen element 22. Fig. 3 illustrates a typical connecting rod 23 suspended in the compression spring 26 which in turn is seated in the bracket 27 which is pivotally attached at 40 to the beam element 16.

This pivotal attachment readily may be effected by means of a machine bolt as illustrated, which

in turn is bushed by a sleeve 41 to relieve the bolt from shearing stresses that otherwise would be exerted thereagainst.

It will be seen that the compression spring 26 is supported on a rubber cushion 42 carried in the bracket 27, and immediately below said bracket is a bumper element 43 on the rod 23, that is provided with a rubber bumper or cushion 44.

The lower end of the rod 23 is carried in the bracket 24 which is pivoted at 25 to the screen element 22 by means of a machine bolt as illustrated. This bolt is also bushed by a sleeve 41 for the purposes hereinbefore described. Where the lower end of rod 23 passes through the bracket 24 it is cushioned in rubber as illustrated at 45. The purpose of the rubber mountings 42 and 45 and the bumper 44 is to absorb vibratory shock particularly when the screen is first set into vibratory movements and before it has acquired its full harmonic frequency.

The details illustrated in Fig. 3 clearly show how each connecting rod 23 is pivotally connected with the beam element 16 and with the screen element 22 thus providing the movable parallelogram action herein defined. This parallelogram action is well illustrated in Fig. 4 wherein the solid lines illustrate a position of the parallelogram corresponding to that illustrated in Fig. 1, and the broken lines indicate another typical position to which the parallelogram may be moved while maintaining the important parallel relationship of the components and particularly while maintaining the original relationship between the feed end of the screen element and the feed chute.

After the optimum angle of operation has been determined by sufficient tests and experience with the material at hand, holes may be drilled through the sides of the beam element 16 corresponding to the aperture 46 in bracket 27 whereupon said bracket may be securely bolted to the beam element. Likewise, holes may be drilled in the screen element 22 corresponding to the aperture 47 in each bracket 24 whereby said brackets may be securely bolted in fixed position with reference to the screen element.

Fig. 5 illustrates diagrammatically another embodiment of the same operating principle wherein a beam element 16a is supported on standards 48 and 49. The beam element 16a is pivoted at 17a to the fixed standard 48 and the screen element 22 which is supported on rods 23 above the beam element 16a instead of below it.

It will be manifest that the angle of inclination of the beam element 16a may be varied about its pivotal axis 17a and the parallelogram action of the several components will be the same as hereinbefore defined.

Obviously the beam element 16 of Figs. 1 and 2 may be supported by standards, if desired, similar to those suggested in Fig. 5 and the beam element 16a of Fig. 5 can well be supported by superstructure similar to that suggested in Fig. 1. The mechanical means for supporting the beam element 16 or 16a is subject to selective variation according to installation requirements and the parallelogram relationship will be maintained throughout a wide selection of mechanical supports.

It is manifest that as a consequence of the parallelogram arrangement herein disclosed, the angle of inclination of the beam element 16 and the screen element 22 may be varied without changing the drive belt 37, because the compres-

sion spring 36 will maintain a suitable tension in said belt in all normal angular positions of the apparatus. The variations in the distance between the drive pulley of the motor and the driven pulley on the screen element are quite small and readily can be compensated for by the compression spring 36.

What we claim and desire to secure by Letters Patent is:

1. In screening apparatus, a rigid supporting member suspended for movement about a pivotal axis at at least one of its ends, a screening member, suspension members mounted for pivotal movement on said rigid member and extending from the rigid member in pivotal connection with the screening member adjacent its ends to permit movement between said members to selective angular positions, said members being constructed and arranged to form a parallelogram in which angular movement of one of said members will produce conjoint changes in the positions of the other of said members and thereby maintain a parallel relationship between the initially parallel members, and means for holding said angular position of the members constant in each selective position.

2. In screening apparatus, a rigid supporting member suspended for movement about a pivotal axis at at least one of its ends, a screening member, suspension members mounted for pivotal movement on said rigid member and extending from the rigid member in pivotal connection with the screening member adjacent its ends to permit movement between said members to selective angular positions, said members being constructed and arranged to form a parallelogram in which angular movement of one of said members will produce complementary changes in the positions of the other of said members and thereby maintain a parallel relationship between the initially parallel members, and means for holding said angular position of the members constant in each selective position.

3. In screening apparatus, a rigid supporting member suspended for movement about a pivotal axis at at least one of its ends, a screening member, suspension members mounted for pivotal movement on said rigid member and extending from the rigid member in pivotal connection with the screening member adjacent its ends to permit movement between said members to selective angular positions, said members being constructed and arranged to form a parallelogram in which angular movement of one of said members will produce reciprocal angular changes in the positions of the other of said members and thereby maintain a parallel relationship between the initially parallel members, and means for holding said angular position of the members constant in each selective position.

4. In screening apparatus, a beam member suspended for movement about a pivotal axis at at least one of its ends, a screening member, suspension members mounted for pivotal movement on said rigid member and extending from the beam member in pivotal connection with the screening member adjacent its ends to permit movement between said member and the beam member to selective angular positions, said members being constructed and arranged to form a parallelogram in which angular movement of one of the members will produce complementary changes in the positions of the other of said members and thereby maintain a parallel relationship between the initially parallel members,

and means for holding said angular position of the members constant in each selective position.

5. Apparatus for screening loose material, comprising a beam member, a screening member, connecting members pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member, means positioned to act on said members for imparting vibratory movement thereto, a fixed support, a pivotal connection holding one end of said beam member on the support, a flexible connection holding the other end of said beam member on said support and being of sufficient length to incline the screen member at different angular positions from the support, and a material feeding device disposed in uniform proximity to the upper end of the screening member in the various inclined positions of said screen member.

6. Apparatus for screening loose material, comprising a beam member, a screening member, connecting members pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member, means positioned to act on said members for imparting vibratory movement thereto, a fixed support, a pivotal connection holding one end of said beam member on the support, a flexible connection holding the other end of said beam member on said support and being of sufficient length to incline the screen member at different angular positions from the support, adjustable means for varying the length of said flexible connection to thereby change the inclination of the screening member, and a material feeding device disposed in uniform proximity to the upper end of the screening member in various inclined positions of said screen member.

7. Apparatus for screening loose materials, comprising a beam member, a screening member, connecting members pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member, means positioned to act on said members for imparting vibratory movement thereto, a fixed support, a pivotal connection holding one end of said beam member on the support, an extensible connecting member holding the other end of said beam member on said support in a position to incline the screening member at selective angular positions, a material feeding device held in a fixed position in uniform proximity to the upper end of the screening member in the various inclined positions of said screening member, and means for rotating the screening member about a fixed axis adjacent said feeding device by extension of the extensible member.

8. In the art of screening loose materials, in which vibratory screening apparatus, consisting of a rigid member, a relatively movable screening member having each of its ends pivotally suspended from the rigid member and pulsating means arranged to effect said relative movement and thereby vibrate the apparatus, is disposed at an inclination in material-receiving relation to a fixed feeding device, the improvement which comprises suspending said apparatus for variation of the inclination of its screening member by movement of same about a fixed axis of rotation at its material-receiving end.

9. Screening apparatus comprising a rigid supporting member adjustably suspended for

movement about a pivotal axis at at least one of its ends, a screening member, connecting rods pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member in parallel relation thereto in various angular positions, an eccentric acting on one of said members, a prime mover on the other of said members, power transmission means extending between the prime mover and the eccentric, and means for maintaining uniform spacing between the prime mover and eccentric in the different angular positions of said members.

10. Screening apparatus comprising a rigid supporting member adjustably suspended for movement about a pivotal axis at at least one of its ends, a screening member, connecting rods pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member in parallel relation thereto in various angular positions, an eccentric acting on one of said members, a prime mover on the other of said members, power transmission means extending between the prime mover and the eccentric, and flexible means for maintaining uniform spacing between the prime mover and eccentric in the different angular positions of said members.

11. Screening apparatus comprising a rigid supporting member adjustably suspended for movement about a pivotal axis at at least one of its ends, a screening member, connecting rods pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member in parallel relation thereto in various angular positions, an eccentric acting on one of said members, a prime mover on the other of said members, power transmission means extending between the prime mover and the eccentric, and spring-actuated means for maintaining uniform spacing between the prime mover and eccentric in the different angular positions of said members.

12. Screening apparatus comprising a rigid supporting member adjustably suspended for movement about a pivotal axis at at least one of its ends, a screening member, connecting rods pivoted on the beam member and on the screening member and disposed in parallel relation for suspending the screening member from the beam member in parallel relation thereto in various angular positions, an eccentric acting on the screening member, a prime mover on the supporting member, power transmission means extending between the prime mover and the eccentric, and a flexible mounting for the prime mover to maintain uniform spacing between said prime mover and the eccentric in the different angular positions of said members.

13. In apparatus of the character described, a beam element pivoted at one end to a stationary support and having its opposite end adjustably supported to position the beam element in different angular positions, screening means in spaced parallel relation to said beam element, a feeding device in proximity to said pivotal support of the beam element for delivering material to be treated to the screening means, and a plurality of parallel connecting members pivoted to said beam element and pivoted to said screening means for maintaining the parallel relationship between said members constant throughout the range of angular movement of the beam element and maintaining a uniform relationship between the feeding device and said screening means in the various angular positions of the beam element.

14. In apparatus of the character described, a beam element pivoted at one end to a stationary support and having its opposite end adjustably supported to position the beam element in different angular positions, screening means in spaced parallel relation to said beam element, a feeding device in fixed relation to said pivotal support of the beam element for delivering material to be treated to the screening means, and a plurality of parallel connecting members pivoted to said beam element and pivoted to said screening means for maintaining the parallel relationship between said members constant throughout the range of angular movement of the beam element and maintaining a uniform relationship between the feeding device and said screening means in the various angular positions of the beam element.

15. In apparatus of the character described, a beam element pivoted at one end to a stationary support and having its opposite end adjustably supported to position the beam element in different angular positions, means for varying the elevation of the adjustable support to thereby change the angular position of said beam element, screening means in spaced parallel relation to said beam element, a feeding device in proximity to said pivotal support of the beam element for delivering material to be treated to the screening means, and a plurality of parallel connecting members pivoted to said beam element and pivoted to said screening means for maintaining the parallel relationship between said members constant throughout the range of angular movement of the beam element and maintaining a uniform relationship between the feeding device and said screening means in the various angular positions of the beam element.

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