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(54) **Screen For A Screening Machine**

(57) An exchangeable planar screen comprises a screen frame (29) having an open lateral wall and a floor (30) for collecting screened granular material, a mesh fabric (31) secured on the frame above the floor to act as a screening surface. Duct means (32), preferably comprising at least two separate and intersecting channels (33) and (35—37), adjoin the fabric and the floor at the open lateral wall of the frame for separately guiding to appropriate outlets material which has

passed through the mesh fabric and material which is retained by the screening surface. The screen is for mounting in a screening machine which has means for supporting one or more of the screens, an inlet for granular material to be screened, and outlets for screened granular material and for undersize and/or oversize foreign matter. The screens enable a screening machine to be adapted to screen fine grains, such as sorghum, rape and milo, without altering the positions of the outlets and any ancillary equipment associated with them.

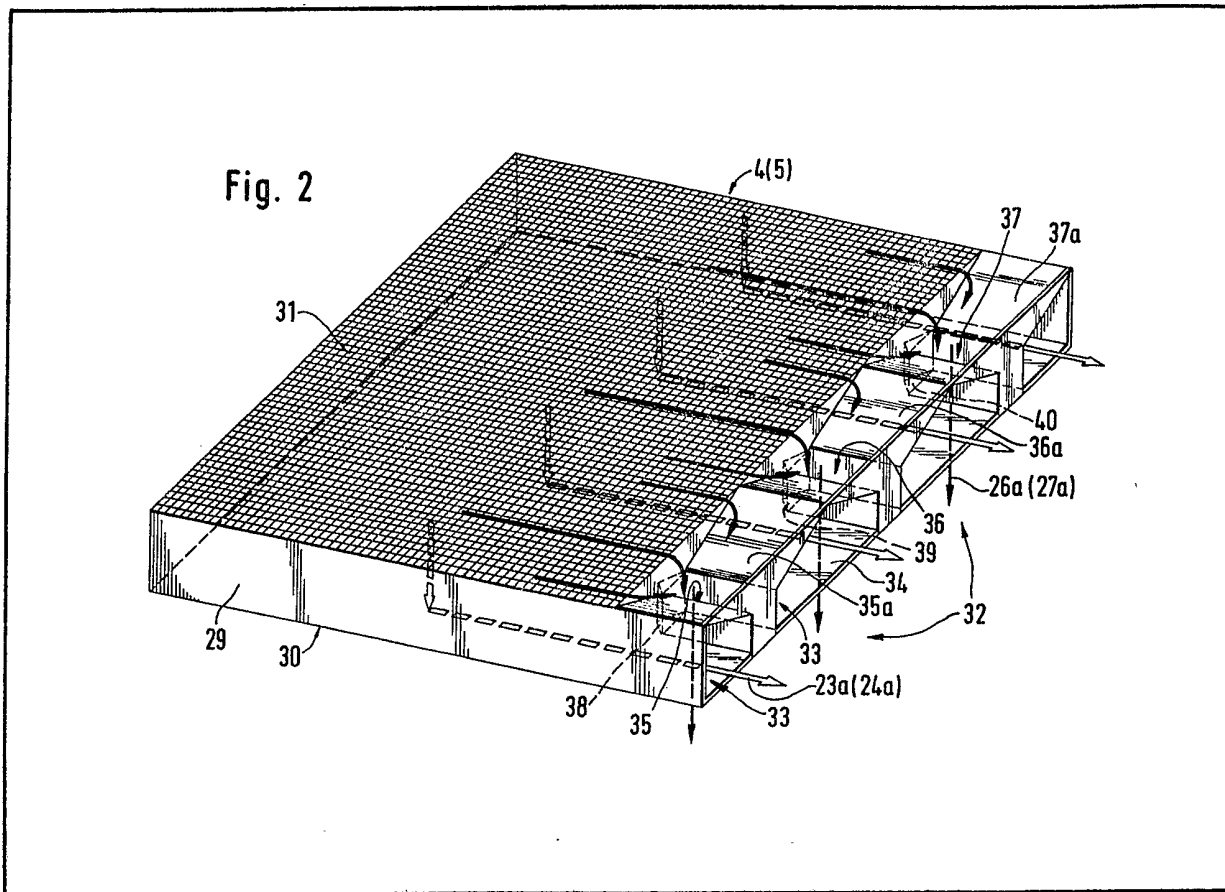


Fig. 1

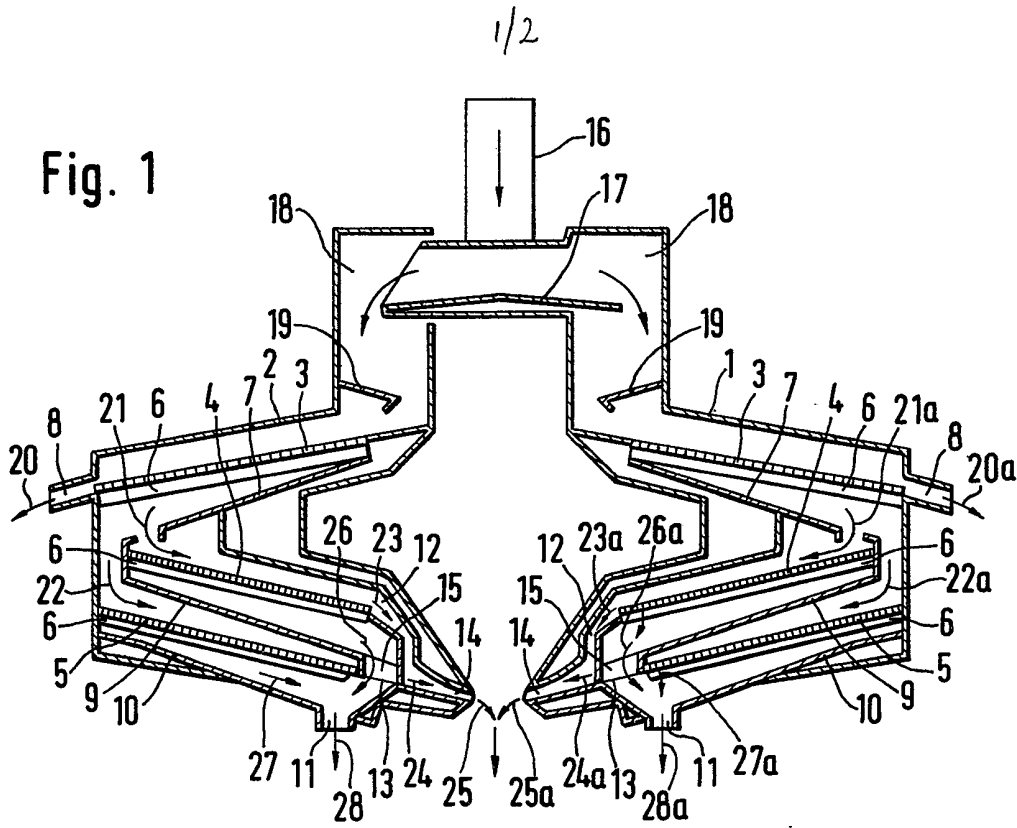
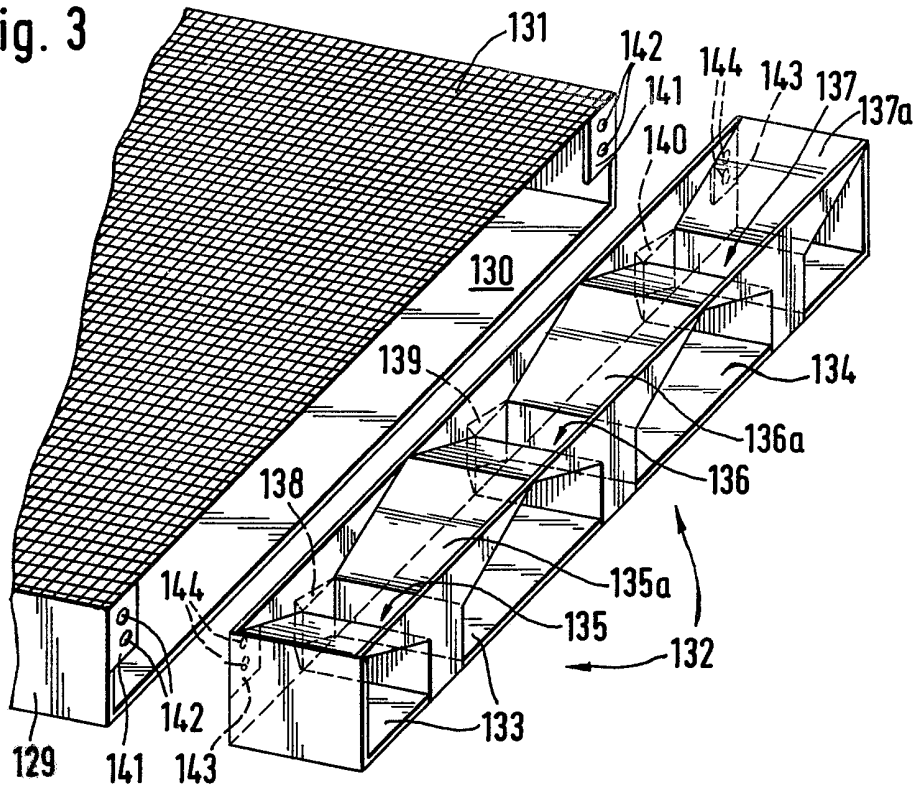


Fig. 3



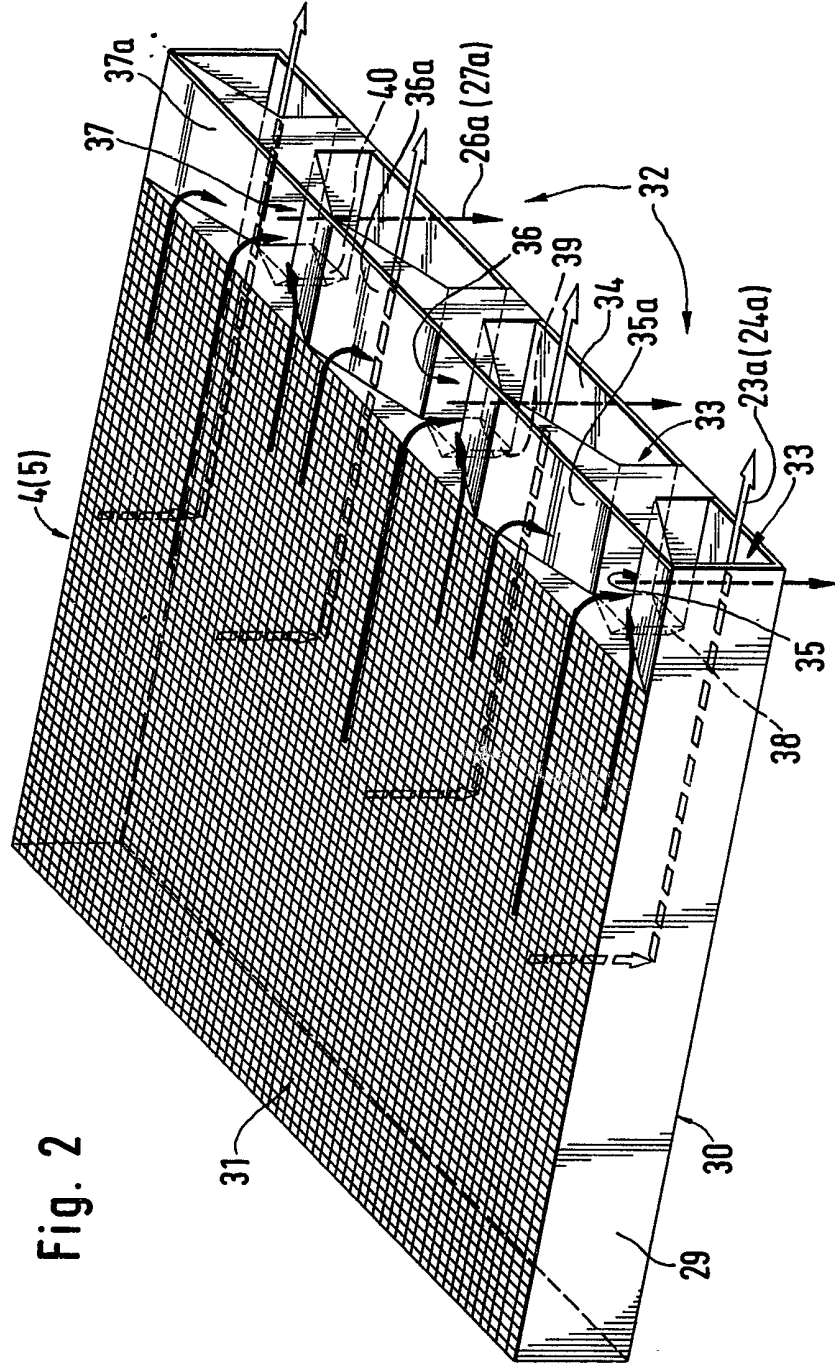


Fig. 2

SPECIFICATION

Screen for a Screening Machine

This invention relates to screening machines, and is particularly concerned with an

- 5 exchangeable planar screen for such a machine.
- In screening cereal grains to separate coarse foreign substances, such as stalks, twine, lumps of rock and soil as well as fine foreign particles such as sand, small grains or broken grains,
- 10 screening machines are employed which include preliminary screens having wide mesh fabric, the so-called coarse screens, as well as subsequent screens having fine meshed fabric, the so-called sand screens. Coarse foreign particles passing
- 15 over the coarse screen are discharged through an outlet whereas the treated material passing through the coarse screen is fed to the subsequent sand screen or to a plurality of parallel connected sand screens arranged downstream of the flow of the treated material. The additional separation performed on the latter screen(s) results in a cleaned product which passes over the sand screens while fine foreign particles pass through the sand screens and are guided to
- 25 corresponding outlets. The cleaned product is supplied to a conveyor or if the separation of fine dust and light particles such as damaged grains, husks, small straw particles and finely crushed grains is desired, the cleaned product is fed to an air sifting machine where the fine foreign particles
- 30 are sucked out or collected in containers and removed.

- The above-described screening process is suitable for relatively large grains, such as for
- 35 example, wheat, rye, barley, oats, corn or rice, but the aforementioned screen arrangement is unsuitable for treating relatively fine grains, such as for example, rape seeds, sorghum or milo because the screening of fine foreign particles cannot be carried out for such fine grains.
- 40 Accordingly, in treating such fine grains it is possible to eliminate only coarser foreign components while the fine grain material passes through the sand screen. Any foreign particles which are larger than the grains, such as burdock in the case of rape seeds, pass over the screen. As a consequence, in the above-described screening machines the outlets for discharging fine foreign particles now discharge the cleaned product
- 50 whereas the outlets normally discharging the cleaned large grain material to a conveyor or to an air sifter would now discharge coarse foreign particles of an intermediate size. In order to avoid this situation and in order to adjust conventional screening machines for the treatment of the aforementioned fine grain cereals, it has been already proposed to cover the sand screen with metal sheets or blind floors and to use the coarse screen or screens only. This temporary
- 60 adjustment, however, is advantageous because of the fact that respective screening surfaces can be loaded to a certain limit only and therefore the height of the processed layers must not exceed a certain limit. Moreover, for screening fine foreign

- 65 particles it is necessary to provide a larger sand screening surface area than the coarse screening surface area and this relatively large sand screening surface area remains completely unused when processing fine grain material.

- 70 According to one aspect of the present invention there is provided in, or for use in, a screening machine for screening granular material to separate oversize and/or undersize foreign matter therefrom, said machine comprising
- 75 means for exchangeably supporting one or more planar screens, an inlet for said granular material, and outlets for said foreign matter and for screened granular material, an exchangeable planar screen wherein the screen comprises a
- 80 screen frame having an open lateral wall and a floor for collecting screened granular material, a mesh fabric secured on said frame above said floor to act as a screening surface; and duct means adjoining said fabric and said floor at said
- 85 open lateral wall for separately guiding to appropriate outlets material which has passed through said mesh fabric and material which is retained by said screening surface.

- According to another aspect of the present invention there is provided a screening machine for screening granular material to separate oversize and/or undersize foreign matter therefrom, wherein said machine comprises means for exchangeably supporting one or more
- 90 planar screens, an inlet for said granular material, outlets for said foreign matter and for screened material, and one or more planar screens as just indicated exchangeably mounted on said support means.

- 100 Thus standard screening machines may be provided with means for removably mounting the present planar screens for separating fine foreign particles so that the screening machine is suitable not only for screening coarse grain material, but
- 105 also for screening fine grain material whereby the screening surfaces are fully utilized. Furthermore, irrespective of the grain size of the processed grain and of the foreign matter, the separated components are discharged always from the same outlets of the screening machine.

- In the preferred embodiment of the present screen, the duct means is in the form of guiding means including a plurality of guiding channels crossing each other in the discharging direction
- 115 and each having a discharge opening arranged in a plane which adjoins the plane of the floor, some of the channels which serve for guiding the screened material each have an inlet opening communicating with the floor, and the others
- 120 which serve for guiding the larger particles each have respective inlet openings separated from the floor and communicating with the screened surface. When a screening machine is to be adjusted for screening fine grain material it is now sufficient to replace each existing sand screen by
- 125 a planar screen provided with a guiding means of this invention so that the guiding means guide the separated material retained on the screen (foreign particles) and the material passing through the

screen (cleaned product) to the outlets of the machine where the corresponding components are discharged even during the processing of large size grain material.

- 5 The guiding means may either be integral with the screen frame to form a single unit therewith or be formed as a separate unit connectable to the open wall of the screen frame. In both cases the combined screen and the guiding means for use
10 in processing fine grain material has a working area which corresponds to conventional sand screens for processing coarser grain material so that both types of the screen can be interchangeably mounted in the machine.
- 15 The guiding channels for the cleaned material and for the foreign particles are preferably arranged alternately side-by-side along the open wall of the frame whereby the channels serving for discharging the large particles are directed
20 perpendicularly to the feeding direction and have inlet openings adjoining the edge of the screen surface and separated from the floor, whereas the channels serving for discharging the cleaned material extend substantially in the feeding
25 direction and have inlet openings communicating with the frame floor and separated from the inlet openings of the adjoining channels. The outlet openings of the respective groups of guiding channels are arranged in two mutually
30 perpendicular planes. In a preferred embodiment, the succession of funnel-like openings of the upright guiding channels occupies the entire length of the adjoining edge of the screening surface whereby the upright channels divide the
35 floor of the frame into discrete channels extending in the feeding direction.

In order to enable the invention to be more readily understood, reference will now be made to the accompanying drawings, which illustrate
40 diagrammatically and by way of example two embodiments thereof, and in which:

Figure 1 is an axial cross section through a schematically illustrated screening machine,

- 45 Figure 2 is a perspective view of a screen provided with integrally connected guiding means; and

Figure 3 shows, in an exploded view, a modification of the screen shown in Figure 2, but having detachable guiding means.

- 50 Referring first to Figure 1, there is shown a screening machine for cleaning corn or other cereals, the machine having two juxtaposed housing parts 1 and 2 mirror-symmetrically arranged about a central axis and connectable in
55 conventional manner to a vibrator (not shown) for imparting a rocking movement to the entire housing. Each of the two housing parts is provided with mounting supports for exchangeably mounting three superimposed
60 screens, namely a coarse screen 3 for screening coarse impurities (coarse foreign particles) and two sand screens 4 and 5 for screening fine impurities (fine foreign particles), all the mounting supports for exchangeably holding the respective
65 screens 3, 4 and 5 being designated by reference

- numeral 6. The coarse screen 3 is located above a distributing floor 7 which uniformly distributes the grain which has passed through the coarse screen 3 and has been subjected to preliminary cleaning,
70 onto the first and second sand screens 4 and 5 respectively. Each housing part 1 and 2 is provided with an outlet 8 at the downstream edge of the coarse screen 3 through which outlet the separated coarse foreign particles are discharged.
75 Below the sand screens 4 and 5 are arranged sloping floors 9 and 10 respectively on which the fine foreign particles are collected and from which the latter particles are discharged through an outlet 11 provided in each of the housing parts 1
80 and 2. The downstream edge of the upper sand screen 4 adjoins a channel 12 which is arranged to discharge cleaned grain onto an intermediate floor 13 leading from the downstream edge of the lower sand screen 5 the cleaned grain then
85 passing through an outlet 14 from which it may be conveyed by a conveyor or passed to an air sifting machine. In order that the fine foreign particles can be discharged from the sloping floors 9 and 10, a discharge chute 15 passes through the intermediate floor 13 and occupies
90 only a fraction of the area thereof so that the cleaned material from the screen 5 can flow to the discharge opening 14.

- Both housing parts 1 and 2 have a common intake port 16 and a common distribution plate 17 which uniformly distributes the grain material to be cleaned to each of two inlet chutes 18. A distributing plate 19 in each of the chutes 18 serves for the uniform distribution of the grain material over the entire breadth of the appropriate
100 coarse screen 3.

- If heavy corn or other material having coarse grains is to be cleaned in the screening machine, both coarse screens 3 and the sand screens 4 and
105 5 are planar screens of a conventional configuration which are mounted in the supports 6 in the illustrated manner to discharge the separated coarse and fine foreign particles from the treated grain material. As has been described above, the coarse foreign particles from each coarse screen 3 are discharged through the associated outlet 8 in the direction of arrows 20 and 20a, while the cleaned material passing through the screens is first collected on the
110 sloping floor 7 and is then discharged onto the sand screens 4 and 5 in the direction of arrows, 21, 22 and 21a, 22a. The separated larger grains passing over the screens are discharged from the screen 4 directly into the channel 12 in the direction of arrows 23, 23a, and from the lower sand screen 5 the cleaned grain particles are discharged through the channel 12 and over the intermediate floor 13 through the outlets 14 in the direction of arrows 25 and 25a. The fine
115 foreign particles passing through the sand screen 4 are discharged from the sloping floor 9 through the chute 15 in the direction of the arrows 26, 26a and join the fine foreign particles passing through the sand screen 5 and falling onto the sloping floor 10 (arrows 27, 27a), to be
130

discharged through the outlet 11 in the direction of arrows 28 and 28a.

If, however, instead of large corn, it is required to process in the screening machine grain

5 material having fine grains such as, for example, sorghum, milo or rape seeds, the conventional sand screens 4 and 5 are removed from the machine and replaced by sand screens according to this invention as illustrated in Figures 2 and 3.

10 The sand screen 4 or 5 shown in Figure 2 includes a screen frame 29, a collecting floor 30 as well as a superimposed screening surface in the form of a fabric 31 having a desired meshed size. Along an open lateral side of the frame are provided guiding means 32 directly adjoining the corresponding edges of the screening fabric 31 and of the floor 30 and forming together with the frame 29 an integral unit. The guiding means 32 is constituted by two groups of crosswise directed channels, the first group comprising channels 33 the lower wall 34 of which is an extension of the floor 30 and which extend in the feeding direction as indicated by arrows 23a and 24a, and the second group comprising three channels 35, 36 and 37 separating the channels 33 and extending initially in the direction of arrows 26a and 27a which are perpendicular to the feeding direction 23a and 24a. The inlet openings 35a, 36a and 37a of the perpendicular channels have a funnel-like configuration and are separated from the inlet openings of the channels 33 by upright partitions. The funnel-like inlet openings adjoin each other and thus extend successively over the entire length of the adjoining edge of the screening fabric 31. The effective cross-sections of respective channel groups are dimensioned so as to be proportional to the working area of the screening fabric 31. The upright partitions separating the upright channels 35, 36 and 37 from the longitudinal channels 33 are provided on their inner sides with deflecting noses 38, 39 and 40 which prevent the accumulation of the sifted material and uniformly distribute the same into respective longitudinal guiding channels 33.

45 In processing the aforementioned small size grain cereals the coarse foreign particles are separated by the coarse screen 3 in the same manner as in the aforescribed processing of large size grain material, whereby the coarse foreign particles passing over the coarse screen 3 are discharged through the outlet 8 in the direction of arrow 20a. The grain material passing through the coarse screen 3 accumulates on the distributing floor 7 and is discharged therefrom onto both sand screens 4 and 5 which separate finer foreign particles from the processed fine grain material such as, for example, rape seeds. In contrast to the setting of the machine for screening coarse grain material, in the screens according to this invention, the fine grains pass through the fabric 31 and fall onto the collecting floor 30 during the rocking movements of the housing parts 1 and 2 and are discharged towards the guiding means 32 at the open wall 34, the fine grains passing through the inlet and outlet

openings of the longitudinal channels 33. The sand screens 4 discharge the fine grains directly into the channels 12 in the direction of arrows 23 and 23a and the lower sand screens 5 discharge the fine grains over the intermediate floor 13 in the direction of arrows 24 and 24a into the channels 12, wherefrom the cleaned fine grain material is discharged through the outlets 14 in the direction of arrows 25 and 25a on a conveyor or into an air sifter.

Foreign matter which is larger than the fine grains is discharged during the vibrations of the housing parts 1 and 2 from the surface of the fabric 31 of each respective screen 4 or 5 in the direction toward the guiding means 32 and drops first into the inlet funnels 35a, 36a and 37a and then into the channels 35, 36 and 37, from which it is discharged through the chutes 15 into the outlets 11. The same discharging process takes place at the lower sand screen 5 where the foreign particles slide through channels 35, 36 and 37 in the direction of arrows 27 and 27a directly into the outlet 11 and are collected in sacks or containers.

From the foregoing description it is apparent that by using the present planar screens provided with duct means the cleaned fine grain material and the separated foreign particles are discharged at the same outlets of the housing of the screening machine as in the case of processing cereals having coarser grains.

In a modification of the screen as illustrated in Figure 3, in contrast to the embodiment of Figure 2, the guiding means 132 of each screen is formed as a separate unit attachable to the screen frame 129. For the sake of clarity, both the duct or guiding means 132 and the screen frame 129 together with its collecting floor 130 and its screening fabric 131 are shown in an exploded view. In an assembled condition, both the screen frame 129 and the guiding means 132 are provided with mounting brackets 141 and 143 facing each other and rigidly connected, for example, by welding to the parts. Each bracket is provided with holes 142 and 144 for fastening screws. In this manner, both the guiding means 132 and the open wall portion of the screen frame 129 are rigidly but detachably connected to each other in the direction of movement of the processed material.

In both embodiments the intersecting channels of the guiding means and the corresponding partitions are made of thin walled metal sheets connected by welding. The longitudinally directed channels 133 extend over the entire width of the open wall of the screen frame 129 and a bottom wall 134 of the channels is flush with the collecting floor 130 of the screen frame. The three perpendicularly directed channels 135, 136 and 137 with respective inlet funnels 135a, 136a and 137a separate the channels 133, and the side walls of the perpendicular channels 135, 136 and 137 adjoining the screen fabric 131 are provided with distributing wedges or deflecting noses 138, 139 and 140 for guiding the screened material.

These noses are also made of thin walled metal sheets connected to the upright wall by welding. The operation of the guiding means 132 is the same as the operation of guiding means 32 in

5 Figure 2.

An advantage of the present planar screens is that conventional screening machines can be employed for processing different grain materials whereby the screening surface installed for
10 screening fine particles can be utilized in a most advantageous manner also for screening fine grain material, thus achieving a higher screening efficiency than in conventional settings of standard screening machines. In addition,
15 irrespective of the size of the grain material, the cleaned product and the separated foreign particles are always discharged at the same outlets of the machine which feature is particularly important in the case when the cleaned product is transported
20 to an air sifter which is installed directly in the corresponding outlet.

Claims

1. In, or for use in, a screening machine for screening granular material to separate oversize
25 and/or undersize foreign matter therefrom, said machine comprising means for exchangeably supporting one or more planar screens, an inlet for said granular material and outlets for said foreign matter and for screened granular material,
30 an exchangeable planar screen, wherein the screen comprises a screen frame having an open lateral wall and a floor for collecting screened granular material, a mesh fabric secured on said frame above said floor to act as a screening
35 surface; and duct means adjoining said fabric and said floor at said open lateral wall for separately guiding to appropriate outlets material which has passed through said mesh fabric and material which is retained by said screening surface.

40 2. A screen as claimed in Claim 1 wherein said duct means is integral with said screen frame.

3. A screen as claimed in Claim 1, wherein said duct means is detachably connected to said screen frame.

45 4. A screen as claimed in any one of Claims 1 to 3, wherein said duct means includes at least

two separate channels crossing each other, one of said channels communicating with said floor and the other channel communicating with said
50 screening surface.

5. A screen as claimed in any one of Claims 1 to 4, wherein said duct means includes a plurality of first channels extending parallel to each other and communicating with said floor, and a plurality
55 of other channels extending between said first channels in a perpendicular direction and communicating with said screening surface.

6. A screen as claimed in Claim 4 or 5, wherein the or each of said other channels has a funnel-like inlet portion adjoining the edge of said fabric.

7. A screen as claimed in Claim 6, wherein the inlet funnel-like portions of said other channels occupy the entire length of the adjoining edge of said fabric.

65 8. A screen as claimed in any one of Claims 4 to 6, wherein the effective cross-section of said first channel(s) is larger than the cross-section of said other channel(s).

9. A screen as claimed in any one of Claims 1
70 to 8, wherein a support is provided for holding said frame in a plane sloping in a discharging direction toward said open wall.

10. In, or for use in, a screening machine for screening granular material to separate oversize
75 and/or undersize foreign matter therefrom, said machine comprising means for exchangeably supporting one or more planar screens, an inlet for said granular material, and outlets for said foreign matter and for screened material, an
80 exchangeable planar screen substantially as hereinbefore described with reference to Figures 1 and 2 or 1 and 3 of the accompanying drawings.

11. A screening machine for screening granular
85 material to separate oversize and/or undersize foreign matter therefrom, wherein said machine comprises means for exchangeably supporting one or more planar screens, an inlet for said granular material, outlets for said foreign matter
90 and for screened material, and one or more planar screens as claimed in any preceding claim exchangeably mounted on said support means.