(54) Plant for screening and mixing soil, gravel, sand, etc.
   Anlage zum Sortieren und Mischen von Erde, Kies, Sand, usw.
   Installation pour cibler et mélanger de la terre, du gravier, du sable, etc.

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Description

The present invention relates to a plant for screening materials such as sand, gravel, crushed aggregate, soil, peat and recoverable excavated material and/or for mixing two or more of said materials with each other or one or more of said materials with suitable alternative materials such as lime, cement or gypsum, said plant including at least one feed station for receiving and discharging the materials, a band conveyor for feeding the materials discharged from the feed station, a device for screening the materials fed by the band conveyor into two or more fractions thereof and at least one mixing device for mixing, with or without any subsequent screening, the materials passing the mixing device.

Materials to be used in the superstructure, i.e. sub-base, base or bearing course and surfacing for streets and roads, air fields, railroads etc., must meet or comply with certain requirements. Streets and roads with a sub-base however, can after a certain time show extensive tracking in the roadway. Tracking, which might cause e.g. aquaplaning on surfaced streets and roads, depend to a large degree that the material in the subbase has settled and the reason therefor often seems to be the too small variations in size of the particles or grains in the material for the subbase. A larger particle size distribution, i.e. larger variations in the particle or grain size, and optimal carrying capacity of the included stone material is therefore aimed at, but this has substantially limited the material which can be used for e.g. subbases for streets and roads. Large areas of the country are short of acceptable material. The building of new roads requires longer transports of material complying with the requirements, especially within the areas short of acceptable material, whereby the costs for the road building are substantially increased.

For being able to increase the exploitation of existing resources, one has started to mix various materials, where one or more materials normally cannot be used as superstructure materials, e.g. for subbases, but the mixture has the required properties for this purpose. This means saving of material usable per se and permits use of otherwise unusable material; in certain cases even, only otherwise unusable material is used. Alternative materials such as crushed rock, rock flour, lime, cement, gypsum, hardcore, ore, ashes etc. can be used and means an additional saving of the resources and an environmental protective factor.

Existing mixers or mixing plants for the abovementioned mixing of superstructure materials, such as e.g. subbases etc. for streets and roads, are large and complex separate units which are expensive and can not be found wherever mixing is required or suitable to carry out.

Mixing devices of prior art type, although not primarily used for mixing materials for the superstructure for e.g. streets and roads, are known from e.g. DE-A-2 240 035, US-A-3 096 212 and US-A-4 164 597.

Plants for screening, crushing and/or other handling and/or processing, are commonly found on places like gravel pits where materials for e.g. superstructures are broken or excavated. However, almost none of these plants for screening are provided with a mixing device of any type (cf. US-A-4 981 204).

It is also not possible, without substantial modification, to combine mixing devices of prior art type, e.g. those according to said publications, with a screening device according to e.g. US-A-4 981 204. The complexity and/or intended use of these mixing devices prevent such a measure.

The plant according to EP-A-0 450 738 is in fact still too complex and expensive.

To overcome the problem outlined above and present a solution thereto, which permits mixing principally everywhere mixing is required or convenient, it has been an object of the present invention to provide, on one of the common plants for screening, a mixing device which has been reduced to a relatively small and less complex unit which is easy to handle and operate.

The object is achieved by any of the plants according to claims 1, 5, 11 and 14 - Preferred embodiments are as defined in the dependent claims.

Therefore, in one embodiment of the present invention, cf. claim 1, the mixing device comprises a frame with movably or immovably mounted mixing means, said frame being settable or positionable on the band conveyor in at least one operating position for mixing and in an inoperative or rest position, said frame also being resiliently or yieldingly mounted on the band conveyor so that it can pivot or deflect from the operating position towards the inoperative or rest position when a certain force is applied on any mixing means by the materials to be mixed.

According to other embodiments of the present invention, the mixing device comprises a frame which is mounted above a screening device in the form of a plate screen (cf. claim 5) or consists of a sheet which can be set or brought on top of a screening device in the form of a screen plate (cf. claim 11) or consists of at least one cylindrical member which is releasably mounted inside a screening device in the form of a screen drum (cf. claim 14).

Thus, the mixing devices according to the invention can be set or brought in one or more operating positions for mixing and preferably also set and locked in a rest position when the plant is used for screening or when mixing is not wanted during screening. The ability of some of the mixing devices to pivot or deflect towards the rest position, prevents damages on the mixing means. Owing to the invention it has also been possible, e.g. immediately after screening, in a subsequent run through the plant, to mix a screened material with another material without time-consuming and expensive transports of material between the screening and mixing operations.

At no prior art mixing device, such as the blender belt of US-A-3 096 212, the mixing device is set in any inoperative position, because blending is carried out all
the time. The blender belt of US-A-3 096 212 has no other function than blending and when blending is not desired, the blender belt is simply not used. Removal of unwanted materials by means of a picker means with picker fingers occurs only during blending and without blending, no such removal is carried through.

Thus, while the present invention is primarily a screening plant which can also be used for mixing, and screening and mixing can be carried out independent of each other, the construction of US-A-3 096 212 is primarily a blender wherein removal of unwanted lumps of material is carried through, said removal however, occurs only during blending and blending is always accompanied by said removal; i.e. blending and removal always occur simultaneously.

In the plant of EP-A-0 450 738 sorting and mixing also always occur simultaneously. Simultaneous sorting and mixing is in fact a requirement for carrying through the method of EP-A-0 450 738, wherein mixing always follows after sorting, i.e. the mixing unit, which is always in operating position, is of necessity located downstream of the sorting units, not upstream thereof, not at or above any of the sorting units and not inside any of them.

Additionally, the prior art presents no resiliently or yieldingly mounted frame-like mixing devices. The mixing unit of EP-A-0 450 738 is e.g. a passive unit without moving parts whatsoever.

The invention will be further described below with reference to the accompanying drawings, wherein

fig. 1 is a schematic side view of an embodiment of a screening and/or mixing plant according to the invention, provided with a first embodiment of a mixing device;

fig. 2 is a plan view of the screening and/or mixing plant with mixing device according to fig. 1;

fig. 3 is a schematic side view of a somewhat different embodiment of a screening and/or mixing plant according to the invention, comprising a second, alternatively constructed embodiment of the mixing device;

fig. 4 is a plan view of the screening and/or mixing plant with mixing device of fig. 3;

fig. 5 is a schematic side view of the screening and/or mixing plant of fig. 3, but with a third embodiment of the mixing device;

fig. 6 is a plan view of the screening and/or mixing plant with mixing device according to fig. 5;

fig. 7 is a schematic perspective view of the swing or plate screen of the screening and/or mixing plants of figs. 1-6;

fig. 8 is a schematic perspective view similar to fig. 7, but here the plate screen is provided with a fourth embodiment of the mixing device;

fig. 9 is an end view of a screen drum for use in a screening or mixing plant;

fig. 10 is a longitudinal section along the line X-X in fig. 9 through a portion of the screen drum;

fig. 11 is an end view of the screen drum of fig. 9 provided with a fifth embodiment of the mixing device; and

fig. 12 is a longitudinal section along the line XII-XII in fig. 11 through the screen drum portion of fig. 10 provided with said fifth mixing device embodiment.

The screening and/or mixing plants illustrated in figs. 1-6 are intended for screening e.g. sand, gravel, crushed aggregate, soil, peat, recoverable excavated material etc. The screening and/or mixing plants are of the type comprising at least one feed station 1 onto or into which material to be screened is brought or fed for discharge onto a screen conveyor 2. The material brought to the feed station has essentially already been subjected to one or more crushing, screening and transporting steps and/or been subjected to another handling and/or processing. The screen conveyor 2 feeds the material to a screening device, here a swing or plate screen 3, in which screening occurs. Instead of a plate screen 3, e.g. a rotatable screen drum or another prior art type of screening device may be used. From the plate screen 3, the fractions of material, i.e. the various screened materials, may then be fed further through a tail conveyor (not shown) and one or more side conveyors (not shown) for storing on the location, for further screening, for mixing with one or more other materials, for another handling and/or processing or for further transport. The screening and/or mixing plant can be mobile as in figs. 1-6 and thus, be provided with a wheel undercarriage 4 fastened to the screen conveyor 2 and having wheels 4a and between the wheels and the screen conveyor any type of device 5, preferably hydraulic, for setting said screen conveyor in a suitable feed position. The screening and/or mixing plant can also be stationary and eventually also comprise a plurality of screening units or screening parts of the above structure and eventually include components for e.g. crushing in e.g. the feed stations or as separate units such that crushing, and/or other handling and/or processing, is carried out along with screening in several steps in several locations. Said parts of the screening and/or mixing plant are of conventional, prior art construction and therefore, not further described here.

To permit mixing of one or more of said screened, or crushed and screened, materials with each other and/or with suitable alternative materials such as lime, cement, gypsum etc., the screening and/or mixing plant
according to the invention illustrated in the drawings further comprises a mixing device 6 which can be set in at least one operating position and a rest position and which in an operating position permits mixing of two or more materials which have been supplied to the screening and/or mixing plant when these materials pass the mixing device. Thus, mixing can be carried out quickly and simply by using one of the screening and/or mixing plants located e.g. on substantially all gravel pits for said mixing. No transports of large mixing machines to the locations where mixing is to be carried out, are required. Larger screening and/or mixing plants having several screening sections or screening parts may have one or more mixing devices 6 as required or desired.

In one embodiment, the mixing device 6 according to the invention is fixedly or releasably mounted on the screen conveyor 2 of the screening and/or mixing plant. The materials to be mixed, are brought or fed into the feed station 1 in certain amounts in proportion to the desired mixture of said materials. Alternatively, the feed station 1 may, with the illustrated shape as a type of charge funnel of feeding hopper, have different compartments for the various materials, whereby discharge of material from the various compartments is controlled proportionally. This control as well as supervision of the level of the materials in the various compartments is carried out preferably electronically and preferably so that mixing is automatically interrupted before there is a shortage of one or more of the materials to be mixed. Other alternatives are that the mixing and/or mixing plant includes more than one feed station, as in figs. 1 and 2 showing two feed stations 1 of the abovementioned hopper type. It is hereby possible to e.g. feed material to be mixed directly from one or more other screening plants or from one or more other parts of a larger screening plant to the feed stations 1 of the screening and/or mixing plant provided with the mixing device 6. Then, the screen conveyor 2 feeds the materials from the feed station(s) to the mixing device 6 for mixing while passing said mixing device before said materials reach the plate screen 3.

The mixing device 6 comprises in one embodiment (cf. claim 1) a frame 7 which is disposed above the screen conveyor 2. On the frame 7 or, as in the drawings, on shafts 8 within said frame, mixing means 9 are operatively or inoperatively provided in accordance with the need and the materials to be mixed at the location. This means that the mixing means 9 may be immovably mounted or they may be movable, e.g. rotatable or movable laterally on or with the shafts 8 and thereby be driven by means of motors (not shown) or by the materials passing the mixing device. The mixing means 9 are, particularly if they are of various types, mounted after each other in the longitudinal direction of the screen conveyor 2, but mixing means of various types may of course also be mounted side by side, e.g. on the same shaft 8. Similarly, mixing means 9 of the same type can be located after each other in the longitudinal direction of the screen conveyor 2 and/or beside each other, according to the requirements and the materials to be mixed. The frame 7 can be immovably mounted on the screen conveyor 2 or resiliently provided thereon.

If the frame 7 is immovable, i.e. not resilient or yielding, then the mixing means 9, which preferably are adjustable in any suitable way, e.g. on the shafts 8, for setting said mixing means in different operating positions in which the materials being mixed are affected in various degrees depending on the material in question, or for setting in an inoperative position or rest position when mixing is not wanted, ought to be resiliently or resiliently mounted on the frame, preferably each mixing means separately or alternatively, all mixing means on each shaft 8 separately. The mixing means 9 can hereby give way or deflect from a set operating position for mixing towards an inoperative position permitting no or substantially no mixing. This inoperative position is not necessarily corresponding with the inoperative or rest position in which the mixing means 9 are set when mixing is not wanted. Deflection occurs if the pressure on the mixing means for some reason should become too large, e.g. because of large stones, whereby damages on the mixing means are prevented. As indicated above, the mixing means 9 can have any suitable shape and position for its function and mixing means of different types can be mixed if this seems to be required for an optimal result. They can e.g. have the shape of a plough 10, they can be designed as resilient teeth 11 as in a harrow and be provided with adjustable and/or replaceable points or cutting shares, they can be rotatable either by means of a motor or due to the influence by the materials to be mixed, and designed as knife crosses 12 suspended in springs (figs. 1 and 2) and/or as discs 13 (figs. 3 and 4). The mixing means 9 are also entirely or partially made of any low-friction plastic material, e.g. high-molecular polyethylene, teflon etc., or of rubber or any other suitable material. The mixing means 9 however, may also be vertically displaceable and/or replaceable to compensate for eventual wear thereof.

If the frame 7 is resiliently or yieldingly mounted on the screen conveyor 2 then the mixing means 9 need not be resilient too, even if it of course is possible. If the mixing means 9 are fixed, they are still designed as described above.

A resilient or yielding frame 7 is shown in the drawings in three different embodiments.

In the first embodiment (figs. 1 and 2), the frame 7 with the mixing means 9, which frame preferably is rectangular in shape and 4 m long, is movably mounted on the screen conveyor 2 through arms 14, two on each side of said screen conveyor, which arms are pivotally attached to the frame at its corners and to the screen conveyor. The frame 7 is held in operating position for mixing by means of at least one hydraulic or spring device, preferably piston/cylinder devices 15 which preferably also are adjustable in an appropriate way such that a certain force, which can vary depending on the materials to be mixed, must be overcome. This means
that a larger force must be applied onto any mixing means 9 by e.g. a stone etc., before the frame is moved from the operating position according to figs. 1 and 2 with the arms 14 directed obliquely upwards/backwards from the screen conveyor 2 (against the feed direction of the materials to be mixed) towards an inoperative position located farther away from said screen conveyor and in which no or substantially no mixing is carried out, with the arms directed substantially perpendicular to the screen conveyor. When the force applied onto the mixing means 9 ceases, the frame returns to its operating position by means of the piston/cylinder devices 15. The frame 7 can preferably be locked in the inoperative or rest position, e.g. by a suitable construction of the piston/cylinder devices 15, so that demounting of the mixing device 6 is not required when the screening plant shall be used for screening material or mixing for some reason is not wanted. Locking of the frame 7 in the rest position can also be carried out manually.

In a modified form of the first embodiment (figs. 3 and 4), which is somewhat more complex, the frame consists of a rectangular upper frame member 7a and a rectangular lower frame member 7b. The upper frame member 7a is through arms 14, two on each side of the screen conveyor 2, immovably mounted on said screen conveyor. The lower frame member 7b is through arms 16 which are pivotally attached to said lower frame member at the corners thereof and to the upper frame member 7a, pivotally suspended in said upper frame member. The mixing means 9 finally are, as in the first embodiment, preferably immovably, i.e. not resiliently or yieldingly mounted on the lower frame member 7b, since said frame member is movable or deflectable from the operative position permitting mixing according to figs. 3 and 4 obliquely upwards and forward in the feed direction of the materials to be mixed, towards an inoperative position wherein the lower frame member 7b is located near the upper frame member 7a so that no or substantially no mixing is permitted. The lower frame member 7b is held in the operative position by means of at least one hydraulic or spring device, here piston/cylinder devices 15 which also permit said deflection of the lower frame member 7b when a certain force, which can be adjusted depending on the mixed material and by means of which the lower frame member is held in operative position by said piston/cylinder devices, is exceeded by the pressure of the materials to be mixed on one or more of the mixing means 9. When the pressure on the mixing means 9 ceases, the lower frame member 7b returns to its operating position by means of the piston/cylinder devices 15. The piston/cylinder devices 15 are preferably also designed such that they permit locking of the lower frame member 7b in the inoperative or rest position thereof, whereby the mixing device 6 when so is required does not hang in the way e.g. during screening. Locking can also be carried out manually with any type of retaining or hook means which are brought to engage and hold the frame members 7a, 7b together with the lower frame member 7b close under the upper frame member 7a.

It is of course also possible to provide the lower frame member 7b resiliently or yieldingly so that it is held in operative position by its own weight and that it is only that weight which must be exceeded for deflecting said lower frame member. However, hydraulic or spring devices can be provided also here, but not for holding the lower frame member 7b in operating position, only to counteract displacement of said frame member from said operating position and facilitate its return thereto.

A vibrating device (not shown) can be provided for vibrating the mixing device 6 if desired and thus facilitate and improve the mixing procedure.

It should be noticed that when mixing is to be carried out, a cloth or plate of e.g. teflon or another material with low friction is preferably placed over the screen plate (preferably uppermost screen plate if many) in the plate screen 3, so that the mixed materials do not fall through said screen plate during passage thereof; thus obviating the risk for that the materials just mixed are screened into various fractions. This problem can be solved in other ways and in certain cases it is desired that screening occurs also after mixing.

In the second embodiment (figs. 5 and 6) (cf. claim 5), the mixing device 6 is instead fixedly or releaseably mounted on the plate screen 3 of the screening and/or mixing plant. The mixing device 6 comprises also here a preferably rectangular frame 7 which through arms 14 is movably located above the plate screen 3 and which is provided with operatively or inoperatively mounted mixing means 9. Here, there are also provided piston/cylinder devices 15 to hold the frame 7 in operating position. These piston/cylinder devices 15 permit displacement or deflection of the frame 7 when any mixing means 9 is affected by the material which is mixed with a larger force than the force by which said piston/cylinder devices keep the frame 7 in operating position, but as soon as this force has ceased, said devices 15 return said frame 7 and thus, the mixing device 6, to the operating position. The piston/cylinder devices 15 also permit locking of the frame 7 (mixing device 6) in an inoperative or rest position. The mixing means 9 can also, as previously stated, be preferably displaceable for setting thereof in different operating positions for mixing in accordance with the materials to be mixed or in an inoperative position permitting no or substantially no mixing, such that said mixing means are not in the way when screening is carried out or when mixing with certain mixing means is not desired. This is important especially if the frame 7 is immovable and thus, not retainable in an inoperative position or rest position. The mixing means 9 can be mounted on the frame 7 such that they are not resilient or not yield, particularly if the frame instead is resiliently or yieldingly mounted on the plate screen 3, but they can also be resiliently or yieldingly mounted thereon. If alternatively the frame 7, as at the mixing devices 6 on the screen conveyor 2, is not resiliently or yieldingly mounted on the plate screen 3, then the mixing means 9, except for being adjustable for
setting in an inoperative position when mixing is not desired, are preferably also resilient or yielding. The mixing means 9 are also otherwise constructed, located and designed as the mixing means described above.

The plate screen 3, which before mixing of the materials to be mixed is provided with a cloth or plate over the screen plate, is preferably also provided with or comprises already a driving device for vibrating said plate screen and thus, the materials passing the mixing device on said plate screen. The mixing device can also here comprise a driving device of its own for vibration of said mixing device independent of the plate screen.

Instead of the mixing devices described above, in a third embodiment of the invention (cf. claim 11), such a mixing device 6 consists of a sheet 17 with mixing means 9, whereby said sheet is placed on the plate screen 3 (see fig. 8). Hereby, the need for a separate cloth or plate over the screen plate 18 (fig. 7) when screening during mixing is not wanted, is eliminated. The sheet 17 is preferably suspended in the plate screen 3 above the screen plate 18 thereto and, when used, lowerable onto said screen plate. However, the sheet 17 may also, when not in use, be brought into compartments (not shown) on the sides of the screening or mixing plate or on top of the plate screen 3. The mixing means 9 are here preferably shaped as teeth (19) and positioned to provide optimal mixing; preferably in a plurality of rows so, that the spaces between said mixing means in a row thereof extending perpendicular to the direction of movement of the materials to be mixed at least partially are covered by the mixing means in the nearest preceding and/or nearest subsequent row of mixing means. Hereby, none of the materials to be mixed can pass the mixing device 6 without being affected by any mixing means 9. Also in this embodiment it is appropriate if the plate screen 3 and thus, the mixing device 6, is vibrated.

In the fourth embodiment of the invention (cf. claim 14), a rotatable screen drum is used instead of a plate screen, the mixing device may, except for on the screen conveyor, also be located inside the screen drum while rotating said drum during mixing or the mixing device can be movably or immovably mounted in any suitable way on or in said screening device. According to this embodiment, the mixing device 6 is at a screen drum 3a according to fgs. 9 and 10 and consists of a cylindrical member 20 (figs. 11 and 12) having radially inwardly directed mixing means 9 of a suitable type, preferably shaped as teeth as in the sheet described above or plough-like mixing means 21. The cylindrical member 20 is brought into the screen drum 3a and releasably fastened therein, so that it can rotate with the drum. The cylindrical mixing device 6 must be able to cover the entire screen drum 3a from the inside or eventually be completed with e.g. other cylindrical members (not shown) so that the materials to be mixed cannot pass out through the screen wall 22 of the drum, which of course is important also when the mixing device is mounted on the screen conveyor. The cylindrical mixing device 6 and eventually other cylindrical elements or cylinder segments are preferably placed, when not in use, on or at the outside of the screening device or other parts of the screening or mixing plant. Otherwise, the mixing device 6 is designed as above and the same measures are taken before mixing commence.

In accordance with the invention, the mixing device can be extendable in length as well as in width to fit, e.g. screen conveyors or screening devices of various sizes and it can be designed such that it by simple means is easy to release from the screening and/or mixing plant, or from that part or those parts thereof, on which it is mounted; the mixing means can be movably or immovably mounted on the frame in any suitable manner; they can be adjustable in any appropriate manner; they can be made resilient or yielding in any suitable way and their number may vary in accordance with the need and the materials to be mixed.

Claims

1. Plant for screening materials such as sand, gravel, crushed aggregate, soil, peat and recoverable excavated material and/or for mixing two or more of said materials with each other or one or more of said materials with suitable alternative materials such as lime, cement or gypsum, said plant including at least one feed station (1), for receiving and discharging the materials, a band conveyor (2), for feeding the materials discharged from the feed station (1), a device (3), for screening the materials fed by the band conveyor (2) into two or more fractions thereof, and at least one mixing device (6), for mixing, with or without any subsequent screening, the materials passing the mixing device, wherein the mixing device (6) comprises a frame (7) with movably or immovably mounted mixing means (9), said frame (7) being settable or positionable on the band conveyor (2) in at least one operating position for mixing and in an inoperative or rest position, said frame (7), or at least a part of it, also being resiliently or yieldingly mounted on the band conveyor (2) so that it can pivot or deflect from the operating position towards the inoperative or rest position when a certain force is applied on any mixing means (9) by the materials to be mixed.

2. Plant according to claim 1, characterized in that the frame (7) is held in the operating position by at least one adjustable hydraulic or spring device (15) which however, permits deflection of said frame when said certain force is applied on any mixing means (9) by the materials to be mixed and which is also designed to permit locking of the frame in the inoperative position.

3. Plant according to claim 1, characterized in that the frame (7) consists of an upper and a lower frame member (7a and 7b respectively), that the
upper frame member (7a) is immovably mounted on the band conveyor (2), that the lower frame member (7b) is pivotally suspended in the upper frame member (7a) such that said lower frame member can pivot or deflect from an operating position towards an inoperative position when a certain force is applied on any mixing means (9) by the materials to be mixed, and that the mixing means (9) preferably are non-resiliently or non-yieldingly mounted on the lower frame member (7b).

4. Plant according to claim 3, characterized in that the lower frame member (7b) with the mixing means (9) is held in the operating position by at least one adjustable hydraulic or spring device (15) which however, permits deflection of said lower frame member when said certain force is applied on any mixing means (9) by the materials to be mixed and which is also designed to permit locking of said lower frame member in the inoperative position.

5. Plant for screening materials such as sand, gravel, crushed aggregate, soil, peat and recoverable excavated material and/or for mixing two or more of said materials with each other or one or more of said materials with suitable alternative materials such as lime, cement or gypsum, said plant including at least one feed station (1), for receiving and discharging the materials, a band conveyor (2), for feeding the materials discharged from the feed station (1), a device (3), for screening the materials fed by the band conveyor (2) into two or more fractions thereof, and at least one mixing device (6), for mixing, with or without any subsequent screening, the materials passing the mixing device, wherein the screening device is a plate screen (3) and that the mixing device (6) comprises a frame (7) which is mounted above said plate screen and provided with movably or immovably mounted mixing means (9).

6. Plant according to claim 5, characterized in that the mixing means (9) are adjustable for setting thereof in different operating positions or in an inoperative or rest position.

7. Plant according to claim 5 or 6, characterized in that the mixing means (9) are resiliently or yieldingly mounted on the frame (7) so that they can pivot or deflect from an operating position towards an inoperative position when a certain, predetermined force is applied thereon by the materials to be mixed.

8. Plant according to claim 5 or 6, characterized in that the frame (7) is settable or positionable above the plate screen (3) in an operating position for mixing and in an inoperative or rest position.

9. Plant according to claim 8, characterized in that the frame (7) is resiliently or yieldingly mounted on the plate screen (3) such that it can pivot or deflect from the operating position towards the inoperative position when a certain force is applied on any mixing means (9) by the materials to be mixed, and that the mixing means (9) preferably are non-resiliently or non-yieldingly mounted on the frame (7).

10. Plant according to claim 9, characterized in that the frame (7) is held in the operating position by at least one adjustable hydraulic device (15) which however, permits deflection of said frame when said certain force is applied on any mixing means (9) by the materials to be mixed and which is also designed to permit locking of the frame in the inoperative position.

11. Plant for screening materials such as sand, gravel, crushed aggregate, soil, peat and recoverable excavated material or for mixing two or more of said materials with each other or one or more of said materials with suitable alternative materials such as lime, cement or gypsum, said plant including at least one feed station (1), for receiving and discharging the materials, a band conveyor (2), for feeding the materials discharged from the feed station (1), a device (3), for screening the materials fed by the band conveyor (2) into two or more fractions thereof, and at least one mixing device (6), for mixing, without screening, the materials passing the mixing device, wherein the screening device is a plate screen (3) and that the mixing device (6) consists of a sheet (17) with mixing means (9), which sheet can be set or brought on top of a screen plate (18) in the plate screen (3).

12. Plant according to claim 11, characterized in that the sheet (17) is suspended in the plate screen (3) in an inoperative or rest position above the screen plate (18) and lowerable therefrom to an operating position on top of said screen plate (18).

13. Plant according to any of claims 5-12, characterized in that the screening device (3; 3a) is provided with or comprises a driving device for setting the screening device and thus, the materials to be mixed, in motion.

14. Plant for screening materials such as sand, gravel, crushed aggregate, soil, peat and recoverable excavated material or for mixing two or more of said materials with each other or one or more of said materials with suitable alternative materials such as lime, cement or gypsum, said plant including at least one feed station (1), for receiving and discharging the materials, a band conveyor (2), for feeding the materials discharged from the feed station (1), a device (3a), for screening the materials fed by the band conveyor (2) into two or more frac-
tions thereof, and at least one mixing device (6), for mixing, without screening, the materials passing the mixing device, wherein the screening device is a screen drum (3a) and that the mixing device (6) consists of at least one, inside the screen drum (3a) releaseably mounted, cylindrical member (20) with radially inwardly directed mixing means (9).

Patentansprüche

1. Anlage zum Sortieren von Stoffen wie Sand, Kies, Schotter, Erde, Torf und förderwürdigem Aushub und/oder zum Mischen von zwei oder mehreren der genannten Stoffe untereinander oder von einem oder mehreren der genannten Stoffe mit geeigneten anderen Stoffen wie Kalk, Zement oder Gips, wobei die Anlage mindestens eine Zuführungstation (1) zum Aufnehmen und Zuführen der Stoffe, ein Förderband (2) zum Fördern der zugeführten Stoffe ab der Zuführungstation (1), eine Vorrichtung (3) zum Sortieren der vom Förderband (2) zugeführten Stoffe in zwei oder mehreren Sorten sowie mindestens eine Mischvorrichtung (6) zum Mischen mit oder ohne anschließendes Sortieren der die Mischvorrichtung durchlaufenden Stoffe aufweist, wobei die Mischvorrichtung (6) aus einem Rahmen (7) mit beweglich oder unbeweglich angebrachten Mischerelementen (9) besteht und der genannte Rahmen (7) in mindestens einer Betriebsposition zum Mischen und einer passiven Position oder Ruheposition auf dem Förderband (2) aufgesetzt oder positioniert werden kann und außerdem, wenigstens teilweise, federnd oder nachgebend auf dem Förderband (2) montiert ist, so daß er aus der Betriebsposition in die passive Position oder Ruheposition wechseln oder wechseln kann, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird.

2. Anlage nach Anspruch 1, gekennzeichnet dadurch, daß der Rahmen (7) durch mindestens eine verstellbare hydraulische Vorrichtung oder Federvorrichtung (15) in der Betriebsposition gehalten wird, durch diese hydraulische Vorrichtung oder Federvorrichtung jedoch, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird, aus der Betriebsposition auch in die passive Position oder Ruheposition wechseln oder wechseln kann und außerdem durch diese Vorrichtung (15) in der Ruheposition verriegelt wird.

3. Anlage nach Anspruch 1, gekennzeichnet dadurch, daß der Rahmen (7) aus einem oberen und einem unteren Rahmenelement (7a) beziehungsweise 7b) besteht, wobei das obere Rahmenelement (7a) unbeweglich am Förderband (2) befestigt ist, das untere Rahmenelement (7b) jedoch schwenkbar im oberen Rahmenelement (7a) aufgehängt ist, so daß das untere Rahmenelement aus einer Betriebsposition in eine Ruheposition wechseln oder wechseln kann, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird und daß die Mischerelemente (9) vorzugsweise nicht federnd oder nicht nachgebend am unteren Rahmenelement (7b) befestigt sind.

4. Anlage nach Anspruch 3, gekennzeichnet dadurch, daß das untere Rahmenelement (7b) mit den Mischerelementen (9) durch mindestens eine verstellbare hydraulische Vorrichtung oder Federvorrichtung (15) in Betriebsposition gehalten wird, durch die genannte Vorrichtung (15) jedoch, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird, auch ausschwenken kann und außerdem durch diese Vorrichtung (15) in der Ruheposition verriegelt wird.

5. Anlage zum Sortieren von Stoffen wie Sand, Kies, Schotter, Erde, Torf und förderwürdigem Aushub und/oder zum Mischen von zwei oder mehreren der genannten Stoffe untereinander oder von einem oder mehreren der genannten Stoffe mit geeigneten anderen Stoffen wie Kalk, Zement oder Gips, wobei die Anlage mindestens eine Zuführungstation (1) zum Aufnehmen und Zuführen der Stoffe, ein Förderband (2) zum Fördern der zugeführten Stoffe ab der Zuführungstation (1), eine Vorrichtung (3) zum Sortieren der vom Förderband (2) zugeführten Stoffe in zwei oder mehreren Sorten sowie mindestens eine Mischvorrichtung (6) zum Mischen mit oder ohne anschließendes Sortieren der die Mischvorrichtung durchlaufenden Stoffe aufweist, wobei die Mischvorrichtung (6) aus einem Rahmen (7) mit beweglich oder unbeweglich angebrachten Mischerelementen (9) besteht und der genannte Rahmen (7) in mindestens einer Betriebsposition zum Mischen und einer passiven Position oder Ruheposition auf dem Förderband (2) aufgesetzt oder positioniert werden kann und außerdem, wenigstens teilweise, federnd oder nachgebend auf dem Förderband (2) montiert ist, so daß er aus der Betriebsposition in die passive Position oder Ruheposition wechseln oder wechseln kann, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird.

6. Anlage gemäß Anspruch 5, gekennzeichnet dadurch, daß die Mischerelemente (9) so verstellbar sind, daß sie in unterschiedliche Betriebspositionen oder in eine passive Position oder Ruheposition gebracht werden können.

7. Anlage gemäß Anspruch 5 oder 6, gekennzeichnet dadurch, daß die Mischerelemente (9) federnd oder nachgebend am Rahmen (7) befestigt sind, so daß sie in eine Ruheposition wechseln oder wechseln können, wenn durch die zu mischenden Stoffe auf sie eine bestimmte, vorher festgelegte Kraft ausgeübt wird.

8. Anlage gemäß Anspruch 5 oder 6, gekennzeichnet dadurch, daß der Rahmen (7) in einer
Betriebsposition zum Mischen und in einer Ruheposition auf dem Blechsortierer (3) einstellbar oder positionierbar ist.

9. Anlage gemäß Anspruch 8, gekennzeichnet dadurch, daß der Rahmen (7) federnd oder nachgebend auf dem Blechsortierer (3) angebracht ist, so daß er aus der Betriebsposition in die Ruheposition schwenken oder wechseln kann, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird, und daß die Mischerelemente (9) am Rahmen (7) vorzugsweise nichtfedernd oder nichtnachgebend angebracht sind.

10. Anlage gemäß Anspruch 9, gekennzeichnet dadurch, daß der Rahmen (7) mindestens eine verstellbare hydraulische Vorrichtung (15) in Betriebsposition gehalten wird, durch die genannte Vorrichtung (15) jedoch, wenn durch die zu mischenden Stoffe auf irgendeines der Mischerelemente (9) eine bestimmte Kraft ausgeübt wird, ausweichen kann und durch die Vorrichtung (15) außerdem in der Ruheposition versiegelt wird.

11. Anlage zum Sortieren von Stoffen wie Sand, Kies, Schotter, Erde, Torf und förderwürdigem Aushub oder zum Mischen von zwei oder mehreren der genannten Stoffe untereinander oder von einem oder mehreren der genannten Stoffe mit geeigneten anderen Stoffen wie Kalk, Zement oder Gips, wobei die Anlage mindestens eine Zuführungstation (1) zum Aufnehmen und Zuführen des Stoffs, ein Förderband (2) zum Fördern der zugeführten Stoffe ab der Zuführungstation (1), eine Vorrichtung (3) zum Sortieren der vom Förderband (2) zugeführten Stoffe in zwei oder mehreren Sorten und mindestens eine Mischvorrichtung (6) zum Mischen ohne Sortieren der die Mischvorrichtung durchlaufenden Stoffe aufweist, wobei die Sortiervorrichtung ein Blechsortierer (3) ist, die Mischvorrichtung (6) aus einer dünne Platte (17) mit Mischerelementen (9) besteht und die genannte dünne Platte (17) oben auf einem Sortierblechs (18) im Blechsortierer (3) aufgesetzt oder positioniert werden kann.

12. Anlage gemäß Anspruch 11, gekennzeichnet dadurch, daß die dünne Platte (17) im Blechsortierer (3) in einer passiven Position oder Ruheposition über dem Sortierblech (18) aufgehängt ist und von dort aus in eine Betriebsposition oben auf dem Sortierblechs (18) abgesenkt werden kann.

13. Anlage nach Anspruch 5-12, gekennzeichnet dadurch, daß die Sortiervorrichtung (3, 3a) mit einer Antriebsvorrichtung zum Einstellen der Sortiervorrichtung, und damit der zu mischenden Stoffe, während des Betriebs ausgerüstet ist oder eine solche enthält.

14. Anlage zum Sortieren von Stoffen wie Sand, Kies, Schotter, Erde, Torf und förderwürdigem Aushub oder zum Mischen von zwei oder mehreren der genannten Stoffe untereinander oder von einem oder mehreren der genannten Stoffe mit geeigneten anderen Stoffen wie Kalk, Zement oder Gips, wobei die Anlage mindestens eine Zuführungstation (1) zum Aufnehmen und Zuführen des Stoffs, ein Förderband (2) zum Fördern der zugeführten Stoffe ab der Zuführungstation (1), eine Vorrichtung (3) zum Sortieren der vom Förderband (2) zugeführten Stoffe in zwei oder mehreren Sorten und mindestens eine Mischvorrichtung (6) zum Mischen ohne Sortieren der die Mischvorrichtung durchlaufenden Stoffe aufweist, wobei die Sortiervorrichtung eine Sortierröll (3a) ist und die Mischvorrichtung (6) aus mindestens einem im Innern der Trommel lösbaren angebrachten, zylindrischen Element (20) besteht, das radial nach innen gerichtete Mischerelemente (9) aufweist.

Revidancements

1. Installation pour cribler des matériaux tels que du sable, du gravier, des agrégats concassés, de la terre, de la boue ou des déblais réutilisables, et/ou pour mélanger deux ou plusieurs desdits matériaux les uns avec les autres ou un ou plusieurs desdits matériaux avec d'autres matériaux appropriés tels que de la chaux, du ciment ou du gypse, ladite installation possédant au moins un poste d'appareillement (1) où sont reçus et déchargés les matériaux, un transporteur à courroie (2) qui introduit les matériaux déchargés sur le poste d'appareillement (1), un dispositif (3) pour cribler les matériaux introduits par le transporteur à courroie (2) en deux fractions ou plus, et au moins un dispositif mélangeur (6) pour mélanger, avec ou sans crielage subséquent, les matériaux passant à travers le dispositif mélangeur, le dispositif mélangeur (6) possédant un cadre (7) pourvu de éléments mélangeurs (9) amovibles ou fixes, le cadre (7) étant réglable ou orientable sur le transporteur à courroie (2) dans au moins une position de travail pour mélanger et dans un position inopérante ou de repos, ledit cadre (7), ou de moins une partie de celui-ci, étant également élastique par rapport au transporteur à courroie (2) de telle manière qu'il puisse pivoter ou dévier depuis sa position de travail vers sa position inopérante ou de repos lorsqu'une certaine force est appliquée sur n'importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés.

2. Installation selon la revendication 1, caractérisée en ce que le cadre (7) est maintenu en position de travail par au moins un dispositif (15) réglable hydraulique ou à ressort qui, toutefois, permet la déviation dudit cadre lorsque ladite certaine force
est appliquée sur n’importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés, et qui, en outre, a été conçu pour permettre le verrouillage du cadre dans sa position inopérante.

3. Installation selon la revendication 1, **caractérisée en** ce que le cadre (7) consiste en un longeron supérieur et en un longeron inférieur (7a et 7b, respectivement), en ce que le longeron supérieur (7a) est amovible par rapport au transporteur à courroie (2), en ce que le longeron inférieur (7b) est suspendu par un système pivotant au longeron supérieur (7a) de telle manière que le longeron inférieur peut pivoter ou dévier depuis une position de travail vers une position inopérante lorsqu’une certaine force est appliquée sur n’importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés, et en ce que les éléments mélangeurs (9) sont de préférence non-élastiques par rapport au longeron inférieur (7b).

4. Installation selon la revendication 3, **caractérisée en** ce que le longeron inférieur (7b), avec les éléments mélangeurs (9), est maintenu en position de travail par au moins un dispositif réglable hydraulique ou à ressort (15) qui, toutefois, permet la déviation dudit longeron inférieur lorsque ladite certaine force est appliquée sur n’importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés, et qui, en outre, a été conçu pour permettre le verrouillage dudit longeron inférieur dans sa position inopérante.

5. Installation pour cibler des matériaux tels que du sable, du gravier, des agrégats concassés, de la terre, de la tourbe et des débris réutilisables, et/ou pour mélanger deux ou plusieurs desdits matériaux, les uns avec les autres ou un ou plusieurs desdits matériaux avec d’autres matériaux appropriés tels que de la chaux, du ciment ou du gypse, ladite installation possédant au moins un poste d’approvisionnement (1) où sont reçus et déchargés les matériaux, un transporteur à courroie (2) qui introduit les matériaux déchargés sur le poste d’approvisionnement (1), un dispositif (3) pour cibler les matériaux introduits par le transporteur à courroie (2) en deux fractions ou plus, et au moins un dispositif mélangeur (6) pour mélanger, avec ou sans criblage subséquent, les matériaux passant à travers le dispositif mélangeur, le dispositif de criblage étant un crible plat (3) et le dispositif de mélange (6) possédant un cadre (7) monté au-dessus dudit crible plat et pourvu de éléments mélangeurs amovibles ou fixes (9).

6. Installation selon la revendication 5, **caractérisée en** ce que les éléments mélangeurs (9) sont réglables pour les mettre dans diverses position de travail ou dans une position inopérante ou de repos.

7. Installation selon l’une quelconque des revendications 5 ou 6, **caractérisée en** ce que les éléments mélangeurs (9) sont élastiques par rapport au cadre (7) de manière à ce qu’ils puissent pivoter ou dévier depuis une position de travail vers une position inopérante lorsqu’une certaine force prédéterminée est appliquée sur ceux-ci par les matériaux destinés à être mélangés.

8. Installation selon l’une quelconque des revendications 5 ou 6, **caractérisée en** ce que le cadre (7) est réglable ou orientable au-dessus du crible plat (3) dans une position de travail pour mélanger et dans une position inopérante ou de repos.

9. Installation selon la revendication 8, **caractérisée en** ce que le cadre (7) est élastique par rapport au crible plat (3) de telle manière qu’il puisse pivoter ou dévier depuis la position de travail vers la position inopérante lorsqu’une certaine force est appliquée sur n’importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés et, que les éléments mélangeurs (9) sont de préférence non-élastiques par rapport au cadre (7).

10. Installation selon la revendication 9, **caractérisée en** ce que le cadre (7) est maintenu en position de travail par au moins un dispositif réglable hydraulique (15) qui, toutefois, permet la déviation dudit cadre lorsque ladite certaine force est appliquée sur n’importe lequel des éléments mélangeurs (9) par les matériaux destinés à être mélangés, et qui par ailleurs a été conçu pour permettre le verrouillage du cadre dans sa position inopérante.

11. Installation pour cibler des matériaux tels que du sable, du gravier, des agrégats concassés, de la terre, de la tourbe et des débris réutilisables, ou pour mélanger deux ou plusieurs desdits matériaux, les uns avec les autres ou un ou plusieurs desdits matériaux avec d’autres matériaux appropriés tels que de la chaux, du ciment ou du gypse, ladite installation possédant au moins un poste d’approvisionnement (1) où sont reçus et déchargés les matériaux, un transporteur à courroie (2) qui introduit les matériaux déchargés sur le poste d’approvisionnement (1), un dispositif (3) pour cibler les matériaux introduits par le transporteur à courroie (2) en deux fractions ou plus, et au moins un dispositif mélangeur (6) pour mélanger, sans criblage, les matériaux passant à travers le dispositif mélangeur, le dispositif de criblage étant un crible plat (3) et le dispositif de mélange (6) consistant en une tôle (17) pourvue de éléments mélangeurs (9), laquelle tôle peut être aménée au-dessus d’une plaque de criblage (18) dans le crible plat (3).
12. Installation selon la revendication 11, caractérisée en ce que la tôle (17) est suspendue dans le cribe plat (3) dans une position inopérante ou de repos au-dessus de la plaque de criblage (18) et peut être abaissée depuis celle-ci pour prendre une position de travail au-dessus de ladite plaque de criblage (18).

13. Installation selon l'une quelconque des revendications 5 à 12, caractérisée en ce que le dispositif de criblage (3 ; 3a) est pourvu ou composé d'un dispositif d'entraînement pour mettre en mouvement le dispositif de criblage et ainsi les matériaux destinés à être mélangés.

14. Installation pour crible des matériaux tels que du sable, du gravier, des agrégats concassés, de la terre, de la tourbe et des déblais réutilisables, ou pour mélanger deux ou plusieurs desdits matériaux les uns avec les autres ou un ou plusieurs desdits matériaux avec d'autres matériaux appropriés tels que de la chaux, du ciment ou du gypse, ladite installation possédant le moins d'approvisionnement (1) où sont reçus et déchargés les matériaux, un transporteur à courroie (2) qui introduit les matériaux déchargés sur le poste d'approvisionnement (1), un dispositif (3) qui crible les matériaux introduits par le transporteur à courroie (2) en deux fractions ou plus, et au moins un dispositif mélangeur (6) pour mélanger, sans criblage, les matériaux passant à travers le dispositif mélangeur, le dispositif mélangeur (6) étant un tambour cribleur et le dispositif mélangeur (6) consistant en au moins un membre cylindrique (20) amovible monté à l'intérieur d'un tambour mélangeur (3a) avec des éléments mélangeurs (9) orientés radialement vers l'intérieur.