Feb. 27, 1951 H. TÜTSCH 2,543,344

ARRANGEMENT FOR DRAWING SAND AND SAND MIXTURES FROM A CONTAINER

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Fig. 1

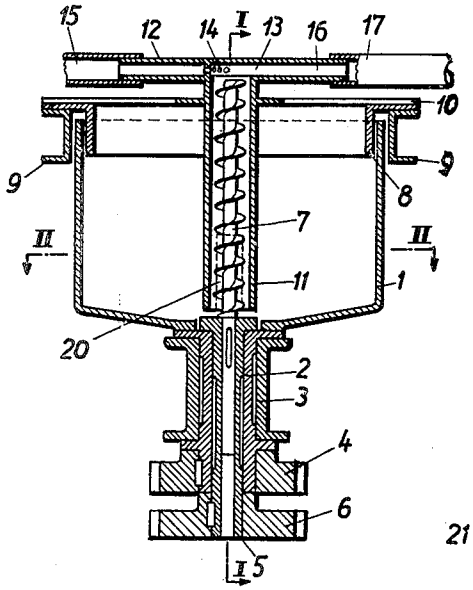


Fig. 2

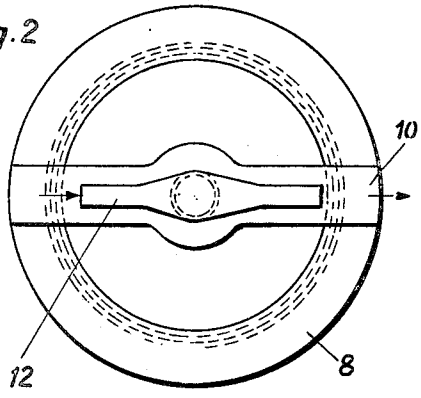
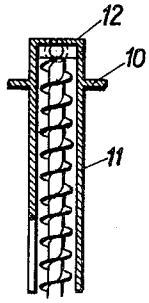


Fig. 3



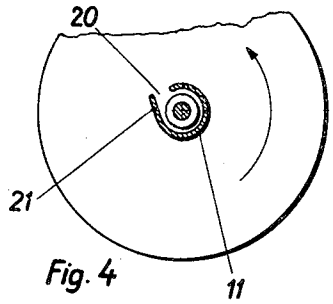


Fig. 4

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Fig. 5

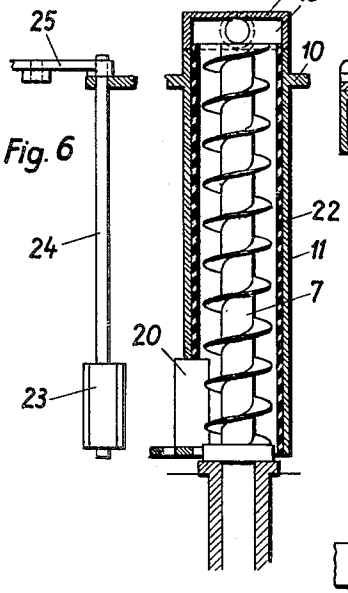
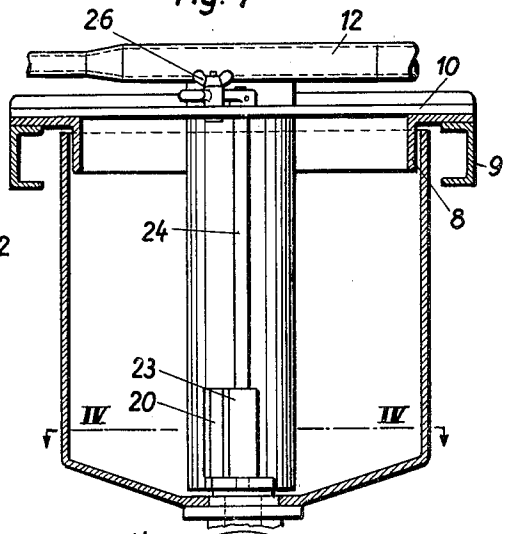


Fig. 6

Fig. 7



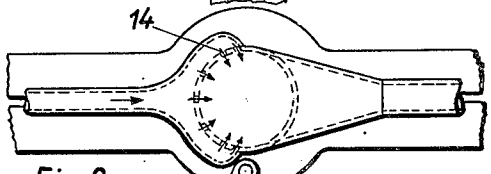


Fig. 8

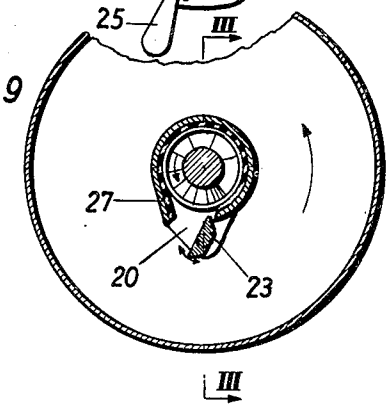


Fig. 9

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ARRANGEMENT FOR DRAWING SAND AND SAND MIXTURES FROM A CONTAINER

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10 Claims. (Cl. 302—50)

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The present invention relates to an arrangement for drawing sand and sand mixtures in dry condition from a container for the purpose of feeding them to a spray pistol. In sand-blasting apparatus, arenaceous quartz of regular granulation is drawn from a container and blown by means of compressed air to the spray pistol. The devices in use with sand-blasting apparatus cannot be used for drawing off sand, and sand mixtures, as sand of irregular granulation or sand mixtures form lumps. Moreover, in sand-blasting an irregular passage of material is of no importance. With sand mixtures, however, which are moistened during spraying with some liquid e. g. water, in order to be sprayed on in paste form, an absolutely regular passage of material is essential for the consistency of the paste. In order to achieve this, it is necessary that the amount of sand conveyed should be exactly regulated by some mechanical means before actual spraying.

The aim of the present invention is to create an arrangement by means of which sand and sand mixtures of the most varied granulation can be drawn from a container without interruption and in a constant flow.

According to the invention, the sand or sand mixture is drawn by means of a screw conveyor from an open container without interruption and in a constant flow and is conveyed to within reach of an air-flow which carries it along to a spray pistol.

The arrangement which carries out the process consists in a non-revolving conveyor tube dipping into a rotating container which can be filled from above. In this tube a screw conveyor turns and raises the material in the conveyor tube. The latter, which encloses a hollow space above the screw conveyor, is closed in its axial direction and possesses at least one entrance hole for compressed air leading into this hollow space at right angles to the tube axis, and also an escape hole opposite said entrance hole.

The attached drawing illustrates one embodiment of the invention. It shows:

Fig. 1 a longitudinal section of the arrangement,

Fig. 2 a top view of the same,

Fig. 3 a section of the conveyor-tube and screw conveyor along line I—I in Fig. 1,

Fig. 4 a section along line II—II in Fig. 1,

Fig. 5 likewise a section of the screw conveyor along line III—III in Fig. 9,

Fig. 6 the sand diffusion vane,

Fig. 7 a view of the screw conveyor with sand diffusion vane,

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Fig. 8 a top view of Fig. 7,

Fig. 9 a section along line IV—IV in Fig. 7.

Material-container 1 is fixed to hollow shaft 2 which is mounted in bearing 3. On the lower end of hollow shaft 2 is fitted driving-wheel 4, e. g. a spur-gear, which serves to drive container 1. Inside hollow shaft 2 is placed hollow spindle 5 driven by toothed wheel 6. Screw conveyor 7 is interchangeably inserted in hollow spindle 5 and tightly fastened with a key. The upper edge of container 1 is covered by ring 8 with angular cross-section. This ring 8 is attached to struts 9 of a stand which is not shown. On ring 8 is fastened cross-piece 10 which is welded to conveyor tube 11. Conveyor tube 11 dips right down to the floor of container 1, though it does not actually touch it. The upper end of the conveyor tube is closed by means of plate 12, lying at right angles to its axis. Between this plate and the upper end of screw conveyor 7 is hollow space 13 into which lead injection openings 14, arranged in a semi-circle, for the purpose of introducing the compressed air, which is supplied through pipe 15. Opposite injection openings 14 is exit 16, through which the compressed air blows the material via pipe 17 to the spray pistol. Through entrance-hole 20 provided in the side of conveyor tube 11 the material which turns with container 1 penetrates into conveyor tube 11 and is raised by screw conveyor 7. In order to direct the material which turns with container 1 round conveyor tube 11 up into the latter, conveyor tube 11 is equipped with diffusion vane 21. The screw conveyor can turn at the same speed as container 1 in which case, it can be rigidly connected with container 1. It is, however, necessary, according to the kind of material to be conveyed, that the screw conveyor should turn at a higher speed than, or even in the opposite direction to, container 1. For this reason it is of advantage to give both screw conveyor 7 and container 1 their own separate drive, which is best fitted with a device for regulating the number of revolutions.

Figs. 5, 6, 7, 8 and 9 show in particular the material-regulating arrangement by means of which the material is transferred from the container to the conveyor tube.

Fig. 5 shows conveyor tube 11, which is coated on the inside with rubber lining 22, as it has been found that rubber resists sand abrasion better than metal. In addition, particles of sand which have become jammed may be pressed into the rubber and in this way escape the screw conveyor. The difference between the outer diameter of screw conveyor 7 and the inner diameter

of the rubber lining of the conveyor tube is twice as large as the largest particle of sand to be conveyed. The purpose of this is:

1. To prevent any particles of sand from getting jammed between the inner casing of the conveyor tube and the screw conveyor, and

2. To cause a layer of material to settle on the casing, so that the friction of the material conveyed does not operate directly on the surface of the conveyor tube lining.

The air-pressure required for blowing out and spraying the material is about 6 atmospheres. At this pressure there is a danger that the compressed air may force its way through the conveyor tube between the thread of the screw conveyor and escape through the sand in the container. In order to prevent this, it is necessary that an air-tight plug be formed in the conveyor tube by the material itself. This is achieved by the material being pressed together by the screw, so as to form a plug which is impervious to the compressed air.

It is, therefore, of advantage for screw conveyor and conveyor tube to be designed in such a manner that the feed aperture for the material in the conveyor tube is at least of the same width as one thread of the screw, and that above the feed aperture at least one such thread is left to press the sand upwards, in order to form a sufficiently airtight plug. For the purpose of directing the material turning with container 1 through aperture 20 of the conveyor tube to within reach of the screw conveyor, diffusion vane 23 is best arranged in front of the aperture; diffusion vane 23 can rotate round axle 24 and lie adjusted at an angle to the tangent of the conveyor tube. To this end, axle 24 of diffusion vane 23 is equipped with lever 25 which can be clamped in various positions by means of a winged screw. A greater or lesser quantity of material is conveyed into the screw conveyor according to the angular adjustment of this diffusion vane. As the material to be conveyed usually consists of a mixture of sand and cement or sand and lime, it tends to form lumps. The supply of material to the conveyor tube must correspond, therefore, as closely as possible to the conveying capacity of the screw. In order to prevent the material from banking up in front of the diffusion vane it is of advantage to equip the conveyor tube in front of the feed aperture with a projection 27 about 1 cm. in length which deflects the material, so that a space is formed between this projection 27 and diffusion vane 23 in which no lumps can develop, whereby the material passes on regularly to the screw conveyor.

The operation of the apparatus is as follows:

The container is filled with sand or a sand mixture, which flows, for example, from a mixing drum, and is set in motion over wheel 4 at the speed of 30 revolutions per minute by means of a drive, not shown here. At this speed the centrifugal force is not strong enough for the mixture to separate. Passing round the conveyor tube and past the appurtenant diffusion vane, the material is conveyed within reach of the screw conveyor, which turns either at the same speed as container 1 or faster. This screw conveyor presses the material in the conveyor tube upwards and forms in the latter a stop plug which prevents the compressed air from escaping through the conveyor tube. Compressed air enters the hollow space at the upper end of the conveyor tube through nozzles 14 and drives out the material conveyed by the screw.

The quantity of material conveyed depends on the number of revolutions of the screw conveyor and can be adjusted exactly to the required proportions by regulating this number of revolutions. It remains constant because at a certain number of revolutions the screw conveyor conveys a regular quantity of material. This makes it possible to feed to the flow of material which is driven off a determined amount of liquid, so that the consistency of the paste sprayed remains unvaried.

I claim:

1. Apparatus for drawing sand and sand mixtures from a container, comprising a container having a charging opening for filling the same from above, a conveyor tube disposed within the container and extending to approximately the bottom of the container, the tube having an inlet for the sand adjacent the bottom thereof, means for rotating the container relatively to said tube, a screw conveyor rotatable within the tube for raising the sand or sand mixture therein, means for driving the conveyor, said tube enclosing a hollow space above the screw conveyor and being closed in the axial direction, said tube having at least one injection opening for compressed air leading into the said hollow space and arranged transversely to the conveyor-tube axis, and provided with a discharge opening opposite the first opening for the mixture of sand and conveying air.

2. Apparatus according to claim 1 wherein the conveyor and container are coaxially disposed and wherein the driving means for rotating the container and screw conveyor operate simultaneously.

3. Apparatus according to claim 1 in which the inlet in the conveyor tube is constituted of an opening in the side of the tube.

4. Apparatus according to claim 1 in which the inlet in the conveyor tube is constituted of an opening in the side of the tube, and a diffusion vane supported adjacent to such inlet for deflecting material thereinto.

5. Apparatus according to claim 1, in which the inlet in the conveyor tube is constituted of an opening in the side of the tube, and a diffusion vane supported adjacent to such opening for directing material thereinto, said vane being adjustable to extend at a sharp angle to the tangent of the conveyor tube.

6. Apparatus according to claim 1, in which the difference between the outer diameter of the screw conveyor and the inner diameter of the conveyor tube is equal to at least twice the size of the largest particle of sand to be conveyed.

7. Apparatus according to claim 1 in which the inlet in the conveyor tube is at least as wide as a thread fillet of the screw conveyor.

8. Apparatus according to the claim 1 in which the length of the conveyor tube above the inlet is at least equal to a thread of the screw conveyor.

9. Apparatus according to claim 1 in which the inlet in the conveyor tube is constituted of an opening in the side of the tube and including a vane supported adjacent to said inlet to deflect material thereinto, and a deflector plate extending outwardly from the tube and in advance of the vane to discourage the formation of lumps at the inlet.

10. Apparatus according to claim 1, in which the conveyor tube is provided with a plurality of

charging openings for compressed air at the discharge end thereof, said openings being arranged approximately in a semi-circle.

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