Aug. 8, 1950 H. A. BROWNE ET AL 2,517,837

BOTTOM TAKE-OFF FOR AIR CONVEYERS

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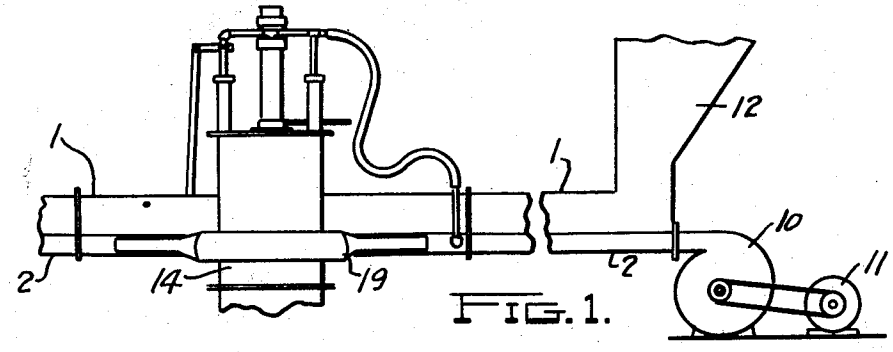



FIG. 1.

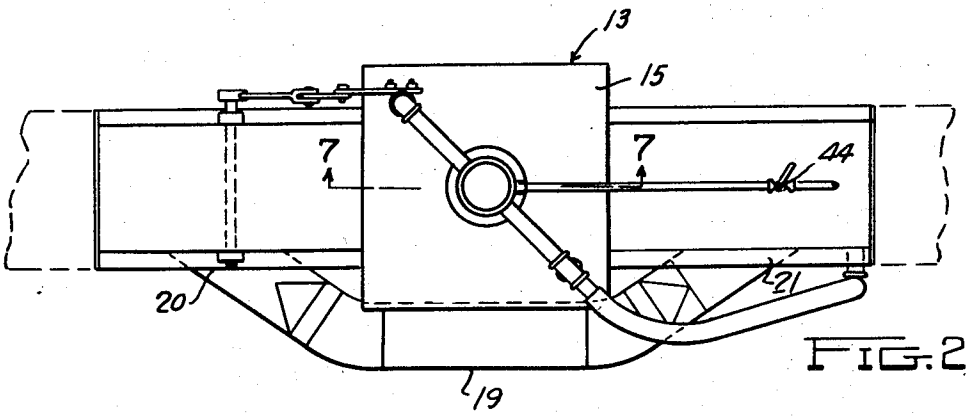



FIG. 2.

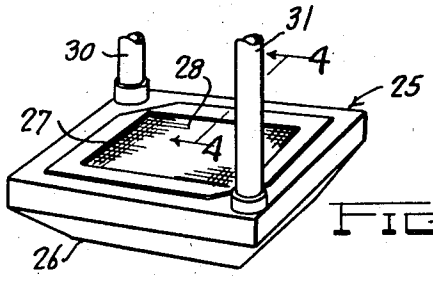



FIG. 3.

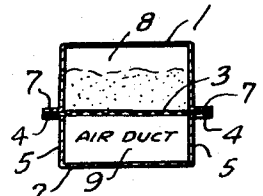



FIG. 5.

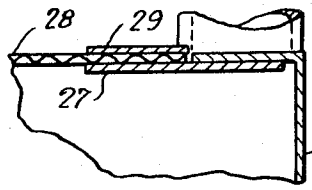



FIG. 4.

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FIG. 6.

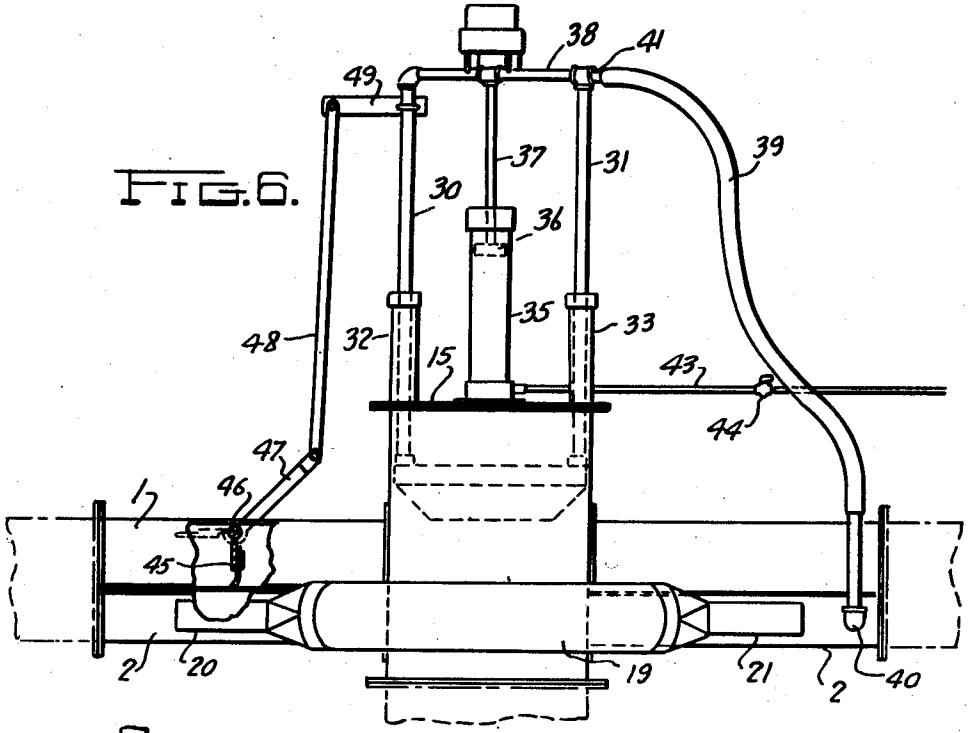
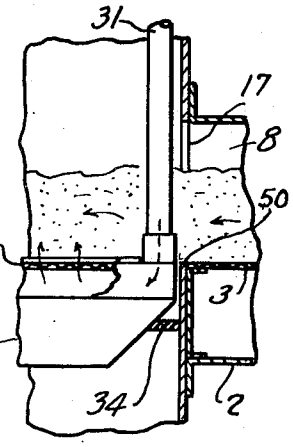



FIG. 8.



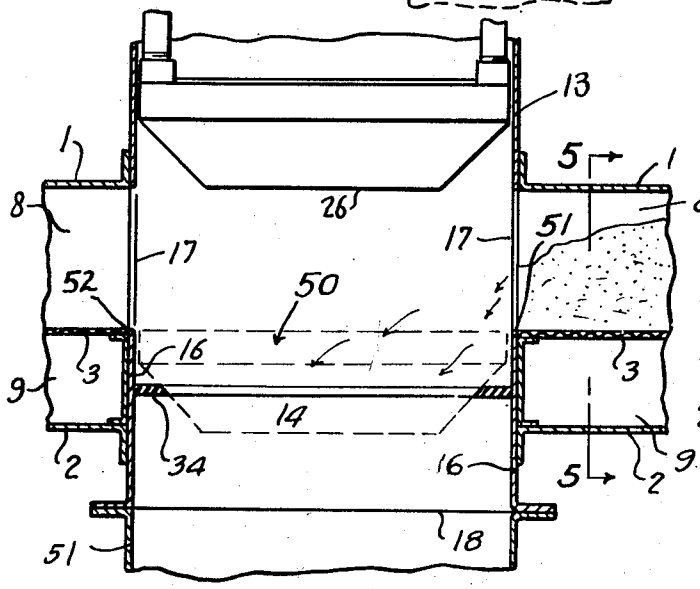




FIG. 7.

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2,517,837

## BOTTOM TAKE-OFF FOR AIR CONVEYERS

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Application April 5, 1949, Serial No. 85,592

11 Claims. (Cl. 302—29)

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This invention relates to a material take-off for an air conveyor.

Air conveyors are now in use for transporting fine pulverulent dry material. Such an air conveyor comprises an inclined porous medium which supports a stream of pulverulent material which is aerated, so that it has somewhat the characteristics of a fluid, by low pressure air passing through the porous medium and the aerated material flows down the inclined porous support due to gravity. Such an air conveyor is shown in the copending application of Henry Ripley Schemm, Serial No. 602,004, filed June 28, 1945, now abandoned. Such air conveyors are utilized to convey numerous finely divided materials such as cement, soda ash, bentonite, lime, and the raw materials from which Portland cement is compounded. It is often highly desirable in the use of an air conveyor to divert all or part of the stream of pulverulent material from the conveyor.

It is an object of this invention to produce a take-off for an air conveyor which is of simple structure, efficient in operation, simple to install in the conveyor line, easy to operate, and substantially trouble-free in operation.

Fig. 1 is a side elevation showing our material take-off assembled in an air conveyor.

Fig. 2 is a top plan view of our material take-off.

Fig. 3 is a detail of the aerator gate.

Fig. 4 is a section along the line 4—4 of Fig. 3.

Fig. 5 is a section along the line 5—5 of Fig. 7.

Fig. 6 is a side elevation of our material take-off.

Fig. 7 is a section along the line 7—7 of Fig. 2 showing the gate in fully open position.

Fig. 8 is a fragmentary section similar to Fig. 7 but showing the gate fully closed.

Referring more particularly to the drawings there is shown a typical air conveyor in the form of metal channels 1 and 2, porous medium 3 extending across channel 2 throughout its length and resting upon the outwardly turned flanges 4 of the side walls 5 of channel 2. The upper channel 1 is inverted and positioned upon the porous medium 3 and bolted to the lower channel 2 by means of bolts which pass through flanges 7 of upper channel 1, flanges 4 and the intervening edges of the porous medium 3. The porous medium 3 cooperates with upper channel 1 to form a material duct 8 and with lower channel 2 to form an air duct 9. Low pressure air is supplied to duct 9 from a blower 10 run by an electric motor 11. By "low pressure air" we mean air at

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a static pressure in the neighborhood of two to sixteen inches water gauge but in some instances, depending upon the head of material in the conveyor, this pressure will run as high as two and one-half pounds per square inch. Powdered material is supplied to duct 8 from hopper 12.

Porous medium 3 can be porous filter stone but preferably takes the form of any low permeability woven fabric material and can be woven, e. g., from cotton or other cellulose fibers or from spun glass fibers. Finely woven, heavy canvas belting is especially advantageous as a porous medium. Such canvas belting is usually a woven multiple ply belting and is usually designated commercially by the number of plies it contains. Single ply woven canvas belting can be used but multiple ply woven canvas belting is preferred, for example, any number of plies from two to eight plies.

The permeability of the porous fabric will be such that at the low pressures above indicated it will pass from two to twelve cubic feet per minute of air through each square foot of area. We have found the canvas belting to be exceptionally efficient where it passes about two to four cubic feet per minute of air per square foot of canvas at a static pressure in the neighborhood of two to eight inches water gauge. The air flowing through the porous medium 3 aerates the pulverulent material which may take the form, for example, of dry powdered cement, mortar, cereal, flour or powdered plastic.

The porous medium 3 is planar in form and is inclined preferably at an angle slightly greater than the angle of repose of the aerated material. The flow of material is indicated by the arrow and the optimum angle of inclination to the horizontal for the conveyor is about five degrees.

Our material take-off comprises a housing 13 having side walls 14, top wall 15 and end walls 16 having opposed openings 17 therein of the same area as the cross-sectional area of material duct 8. Housing 13 is assembled in the air conveyor so that openings 17 are aligned with the ends of material ducts 8 and so that the end walls 16 close the ends of air ducts 9. The lower end of housing 13 is open as at 18.

A bypass conduit 19 connects into air duct 9 on opposite sides of housing 13 as at 20 and 21 so that low pressure air is continuously bypassed from the portion of air duct 9 to the right of housing 13 to the portion of air duct 9 to the left of housing 13. Thus, bypass 19 permits one blower 10 to furnish air to the air con-

veyor throughout its length on opposite sides of the take-off.

An aerated gate is provided for bridging the gap or opening 50 between the ends 51, 52 of porous medium 3. This gate should be removable from said gap 50 so as to connect gap 50 with duct 8 to the right of housing 13. To this end an aerated gate 25 in the form of a sheet metal box 26 having an opening 27 in the top thereof is mounted in housing 13. Gate 25 has the same contour as the cross-sectional contour of housing 13 and thus has a snug fit in housing 13. Gate 25 is removable from opening 50 preferably by lifting the same vertically in housing 13. Opening 27 is closed by a porous medium 28 preferably of the same material as porous medium 3. Preferably porous medium 28 is a multiple ply canvas fabric and extends over opening 27 and is clamped to box 26 around the periphery of opening 27 by clamping ring 29.

Air is supplied to gate 25 by pipes 30 and 31 which are reciprocably mounted in cylindrical guides 32 and 33 fixed to the top 15 of housing 13. Gate 25 is dimensioned so that it will span the space between openings 17 in housing 13. The bottom of gate 25 is tapered and in lowered position is arranged to seal against rectangular flexible seat 34 fixed in housing 13.

For moving the gate 25 upwardly and downwardly there is provided an air cylinder 35 mounted centrally on top 15 of housing 13. Piston 36 is reciprocably mounted in cylinder 35 and carries a piston rod 37 which supports cross pipe 38 which is connected to, and communicates with, the upper ends of pipes 30 and 31. A flexible hose 39 communicates with air duct 9 as at 40 and with pipe 38 as at 41 to supply air through pipe lines 30 and 31 to gate 25 from which it passes upwardly through fabric 28. Compressed air for raising piston 36 is supplied to cylinder 35 through air line 43 controlled by valve 44 through which air can be admitted to, and exhausted from, cylinder 35.

A damper 45 is pivoted on shaft 46 in material duct 8 and is connected by means of crank arm 47 and link 48 with bar 49 which is clamped or otherwise fixed to pipe 30.

In lowered operative position, Fig. 8, gate 25 seals against flexible seat 34 and porous top wall 28 is flush with fabric 3 in conveyor 1, 2. Gate 25 forms an aerated floor between openings 17 in housing 13 so that gate 25 cooperates with housing 13 to form connecting air and material ducts between the air and material ducts (9, 8) on opposite sides of housing 13. Since air is supplied continuously through lines 39, 38, 30 and 31 to gate 25, this air passes through porous fabric 28 and aerates the material thereover. Thus, with the gate in lowered position, material flow continues right through air conveyor and at this time, of course, damper 45 will be open, dotted line showing, Fig. 6.

If it is desired to take off the material from the air conveyor, then compressed air is admitted to cylinder 35 which acts through piston 36 and rod 37 and pipes 31 to raise gate 25 to the full line position shown in Fig. 7, thus removing the bridge between the material ducts 8 which connect into openings 17 on opposite sides of the housing 13.

With gate 25 elevated, the material flows through air duct 8 until it reaches the right hand opening 17 whereupon the material falls downwardly in housing 13 and through opening 18 into discharge duct 51. When gate 25 is elevated, damper 45 is closed so that if any material should slop over through left hand opening 17 this material will be stopped by the fully closed damper 45. It is understood that bypass 19 at all times supplies air from fan 10 from the air duct 9 on the right hand side of housing 13 to the air duct 9 on the left hand side.



The top of gate 25 should preferably be made porous throughout as great an area as possible. The ideal condition would be to have porous top 28 extend from one opening 17 to the other opening 17 in housing 13 so that the aeration of the material flowing through the housing and over the gate will not be interrupted. As a practical matter, porous web 28 covers a substantial portion of the area in housing 13 between opening 17 and is sufficient to aerate the material and continue its flow through the material take-off when the gate is lowered.

Air pipe lines 30 and 31 raise and lower with gate 25. As pipe 30 raises it acts through link 48 and crank 46 to close damper 45 and as pipe 30 lowers with gate 25, link 48 and crank 46 operate to open damper 45.

We claim:

1. A material take-off for an air conveyor adapted to convey aerated pulverulent material comprising a housing having an inlet opening for aerated material and an outlet opening for aerated material spaced from said inlet opening, a movable gate for bridging the space between said openings, said gate having a porous top wall, and means for supplying gas under pressure to said gate whereby when the gate is in bridging position between said inlet and outlet openings the pulverulent material is aerated by gas passing through said porous top wall and flows from the inlet over the gate and through said outlet.

2. The material take-off claimed in claim 1 wherein the inlet and outlet openings are located in the side walls of said housing and the gate in bridging position has the porous top wall substantially flush with the lower edges of said inlet and outlet openings.

3. The material take-off claimed in claim 2 wherein the housing has an opening in the bottom thereof and means are provided for elevating the movable gate above the lower edge of said inlet opening whereby the material flows from the inlet opening downwardly through the housing and outwardly through the bottom opening.

4. A material take-off for an air conveyor adapted to convey aerated pulverulent material comprising a housing having an inlet opening through which the aerated material flows into the housing and an outlet opening spaced from the inlet opening through which the aerated material flows out of the housing, a movable gate for bridging the space between said openings, said gate comprising a hollow body having a porous top wall, means for supplying gas under pressure into the hollow body whereby when the gate is in bridging position between said inlet and outlet openings the pulverulent material is aerated by gas passing through said porous top wall and flows from the inlet over the porous top wall and out of said outlet.

5. The material take-off claimed in claim 4 wherein the gate is reciprocable in said housing into and out of bridging position and wherein the inlet and outlet openings are positioned in the side walls of said housing.

6. The material take-off claimed in claim 5 wherein the gate in bridging position has its porous top wall substantially flush with the lower

edges of said inlet and outlet openings, and means for elevating the gate whereby the porous top wall will be raised above the lower edges of said inlet and outlet openings and the flow of material through the housing interrupted.

7. A material take-off for an air conveyor adapted to convey aerated pulverulent material comprising a housing having an inlet opening for aerated material and an outlet opening for aerated material spaced from said inlet opening, a movable gate for bridging the space between said openings, said gate having a top wall of woven fabric material, and means for supplying gas under pressure to said gate whereby when the gate is in bridging position between said inlet and outlet openings the pulverulent material is aerated by gas passing through said fabric top wall and flows from the inlet over the gate and through said outlet.

8. The material take-off claimed in claim 7 wherein the woven fabric is a multiple ply canvas belting material.

9. In combination an air conveyor adapted to convey aerated pulverulent material comprising a housing having inlet and outlet openings therein, an inclined porous support leading to said inlet opening, an inclined porous support leading from said outlet opening, a plenum chamber beneath each of said porous supports containing gas under pressure which flows upwardly through



said porous supports to aerate the pulverulent material flowing downwardly thereon, a gate in said housing having a porous support for bridging the gap between the inlet and outlet openings, said gate including a plenum chamber beneath said porous support containing gas under pressure which flows upwardly through said porous support to aerate the pulverulent material thereon, said gate in one position having its porous support aligned with the porous supports of said air conveyor whereby the aerated material flows through the inlet across the gate and out of the outlet, said gate in another position having its porous support offset from the porous supports in said air conveyor whereby flow of aerated material from the inlet to the outlet opening is interrupted.

10. The combination claimed in claim 9 wherein the housing has a bottom opening through which the material flows from said inlet opening when the gate is positioned with its porous support offset from the porous supports of said air conveyor.

11. The combination claimed in claim 10 including an air bypass conduit between the plenum chambers on opposite sides of said housing.

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No references cited.