March 1, 1966 K. M. ALLEN ETAL 3,237,753

ELEVATOR FOR FRAGILE, DISCRETE MATERIAL

Original Filed Sept. 24, 1962

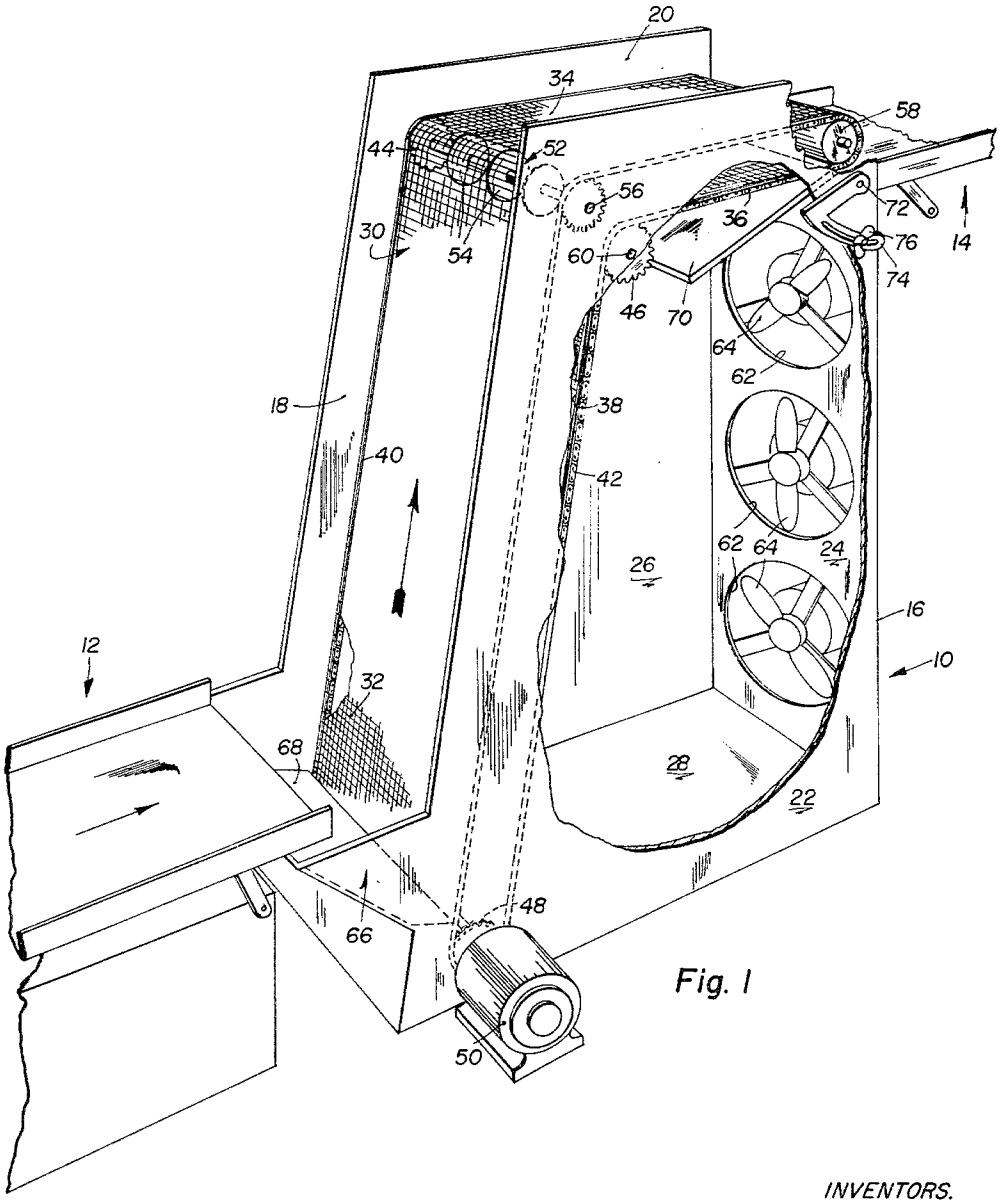

Fig. 1

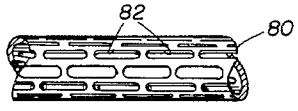

Fig. 2

INVENTORS.

KENNETH M. ALLEN
CHESTER H. HARPER

BY
BUCKHORN, CHEATHAM & BLORE
ATTORNEYS

United States Patent Office 3,237,753 Patented Mar. 1, 1966

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ELEVATOR FOR FRAGILE, DISCRETE MATERIAL

Kenneth M. Allen and Chester H. Harper, Newberg, Oreg., assignors to Allen-Harper, Inc., Newberg, Oreg., a corporation of Oregon

Continuation of application Ser. No. 225,728, Sept. 24, 1962. This application Feb. 8, 1965, Ser. No. 438,146
4 Claims. (Cl. 198—129)

This is a continuation of our copending application Serial No. 225,728, filed September 24, 1962.

Our present invention comprises an elevator for fragile, discrete materials of flake type such as potato chips, crackers, and the like. The invention is of particular utility in the manufacture of potato chips in which it may be desirable to elevate the potato chips from a floor-level fryer to an overhead conveyor for distributing the chips into a battery of floor-level packaging machines. A bucket or bracket type elevating conveyor is very wasteful of such articles since the buckets or brackets crush many of the chips. As a result elevators of the flat belt or screen type have been employed in which the chips into a battery of floor-level packaging machines. by gravity. Such a conveyor must be extremely long since the maximum angle of inclination is around twenty degrees, resulting in loss of valuable space and in some cases the necessity for turntables to bring the potato chips back overhead in the available plant space.

The present invention comprises means for elevating such articles by means of a screen type belt conveyor to which the articles are held by suction and which may travel at a steep inclination closely approaching ninety degrees to the horizontal.

An object of the present invention is to provide a conveyor of the foregoing type in which means are provided to regulate the suction force holding the material to the screen so as to minimize breakage, adapt the machine to articles of different types, and control the quantity of material elevated thereby per increment of time so as to regulate the capacity of the elevator to the capacity of succeeding machines to which the material is to be fed.

The objects and advantages of the present invention will be more readily apparent from inspection of the following specification taken in connection with the accompanying drawings, wherein like numerals refer to like parts throughout, and in which the invention is described and illustrated.

In the drawings,

FIG. 1 is a view in perspective, with parts broken away, illustrating a preferred form of the present invention in association with material supplying and material removing conveying means; and

FIG. 2 is a partial side view of a modified form of conveyor supporting roll.

Referring to FIG. 1, the elevator **10** of the present invention is illustrated in association with a material supplying conveyor **12** for feeding materials to the elevator and a second material conveying means **14** for removing materials from the elevator.

The elevator **10** comprises a suction box **16** having an open, upright side **18** and an open, horizontal top **20**, the remainder of the box comprising vertical sides **22**, **24** and **26** with which may be associated a bottom wall **28**, which in practice may be provided by the floor of the space upon which the elevator rests. An endless screen **30** is mounted on the box in such manner that a nearly vertical flight **32** thereof spans the open side **18** and a succeeding horizontal flight **34** thereof spans the open top **20**. The flights **32** and **34** together constitute the feeding flight of the screen and the return flight

of the screen is constituted by a flight **36** parallel to the flight **34** and a flight **38** parallel to the flight **32**. The screen is preferably attached between parallel sprocket chains **40** and **42** which are guided by sprockets such as the sprockets **44** and **46**. The lowermost part of the screen is trained around a roll **48** mounted horizontally within the lower front portion of the suction box and connected to a driving motor **50**.

At the junction of the flights **32** and **34** the feeding flight of the screen is guided around a skeletal roll **52** comprising a plurality of thin discs **54** mounted upon a horizontal shaft **56**. The screen is then guided around a solid roll **58** at the end of the horizontal flight **34**. At the junction of return flight portions **36** and **38** the screen is guided around a suitable roll (not shown), mounted upon a shaft **60**.

The vertical wall **24** is provided with a plurality of air outlet openings **62** in each of which there is mounted a motor driven propeller **64** driven in such direction as to exhaust air from the box and create a negative pressure therein. Air is drawn into the box through the feeding and return flights of the screen. The flow of air is relatively unimpeded by the skeletal roll, but is blocked by the solid roll **58**.

The feeding conveyor **12** drops the material into a chute **66** having an inclined bottom wall **68** terminating closely adjacent the lower portion of the upwardly moving feeding flight **32**. The chips or other materials are thereby delivered into such proximity to the feeding flight of the screen that they may be picked up and held in a layer against the outer surface of the screen. The holding force will continue while the screen passes around the skeletal roll **52** but will be discontinued when the screen passes around the solid roll **58** in order that the material may be released to drop into the removing conveyor **14**.

Situated beneath the horizontal return flight **36** is an adjusting vane **70** pivotally mounted on a shaft **72** adjacent and beneath the solid roll **58**. A slotted arcuate arm **74** is affixed to the shaft **72** and a wing nut clamping device **76** is provided to hold the vane **70** in the desired position. The vane provides a gradual reduction of flow of air through the upper horizontal flight **34** of the conveyor as the solid roll **58** is approached. If such vane is omitted or moved to a position which is too low, there is an abrupt change in air flow through the flight **34** from a relatively high rate to substantially zero rate immediately adjacent the roll **58**. The result is that air entering the top of the flight immediately adjacent the roll **58** has relatively high velocity over the top of the roll in a direction opposite the direction of movement of the flight **34**. This causes particles of light weight materials to be held from movement with the conveyor. The result is a piling up of such materials on the flight **34** adjacent the roll **58** and then the discharge of large bunches of such material over the roll **58**. By adjusting the position of the vane **70** the negative pressure applied to the upper flight **34** and therefore the amount of air drawn through the upper flight can be reduced to a desired value. Also, the negative pressure and the amount of such air gradually decreases along the flight as the discharge portion of the flight is approached so that the tendency for light material to pile up on the flight is largely eliminated.

The same type of problem at the upper end of the vertical or steeply inclined flight **32** is encountered if the horizontal flight **34** is omitted. It is extremely difficult on such a vertical or steeply inclined flight to gradually reduce the negative pressure adjacent the upper end of such flight so that particles or flakes of light material are carried over the upper roll without being forced rearwardly and dislodged from the flight so that they fall downwardly. The gradual reduction of negative pressure

can, however, be accomplished on a horizontal flight as explained above, and it will be apparent that such flight need not be exactly horizontal but that it may also be inclined so long as its inclination is substantially less than that of the steeply inclined flight and such that the particles or flakes will not slide downwardly thereon when the negative pressure applied to such flight approaches zero.

If the material being conveyed contains substantial moisture or other volatile liquid, it will be apparent that the negative pressure applied to such material in conjunction with the rapid movement of air past the particles of such material will produce a rapid drying action. This will result in rapid cooling of heated materials containing volatiles. For example, freshly cooked potato chips contain substantial moisture and are in a heated condition and can be rapidly cooled and dried while being elevated to the input of packaging machines. Also, flakes or other particles of cereal products which have been sprayed with a sugar solution can be rapidly dried and, if desired, heated air or other gas can be directed toward the material on the conveyor so as to be drawn through such material by the negative pressure in the interior of the suction box **16**.

A different form of skeletal roll which may be substituted for the roll **52** is illustrated in FIG. 2 as comprising a hollow cylinder **80** having a plurality of closely spaced slots **82** therein. It is apparent that other types of skeletal rolls may be utilized, and it is also apparent that it may de desirable, in some instances, to position the vane **70** between the conveyor flights **34** and **36**.

The conveying means **12** and **14** herein illustrated may be such as disclosed and claimed in our prior Patent No. 2,899,044, issued August 11, 1959, or may be any other suitable type of conveying means.

Having illustrated and described a preferred embodiment of the invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. We claim as our invention all such modifications as come within the true spirit and scope of the following claims.

What is claimed is:

1. An elevator for fragile, discrete materials comprising:
(a) a suction box having an open upright side and an open top,
(b) an endless screen having a steeply inclined flight spanning said open upright side and a succeeding substantially horizontal second flight spanning said open top and having a discharge portion,
(c) means for supporting said endless screen including a skeletal roll at the junction of said inclined and horizontal flights,
(d) means for driving said screen,
(e) means including a chute terminating adjacent the outer surface of said inclined flight for delivering materials to said elevator,
(f) means for creating negative air pressure associated with said suction box sufficient to hold materials of the above-mentioned type to the outer surface of said inclined flight,
(g) and means within said suction box for varying the negative air pressure applied to said second substantially horizontal flight as said discharge portion is approached, comprising a pivoted vane positioned beneath said second flight and adjustably movable to various inclinations within said suction box.

2. In an elevator for fragile, discrete materials,
a suction box having an open upright side and an open top,
an endless screen having a steeply inclined flight spanning said open upright side and a succeeding substantially horizontal second flight spanning said open top and having a discharge portion,
guide means for supporting said endless screen at the junction of said inclined and horizontal flights,

means for driving said screen,
means for delivering materials to said inclined flight,
means for creating negative air pressure in said suction box sufficient to hold materials of the above-mentioned type to the outer surface of said inclined flight,
and means within said suction box for gradually reducing the negative air pressure applied to said second substantially horizontal flight as said discharge portion is approached.

3. In an elevator for fragile, discrete materials,
an endless screen,
means for guiding the endless screen in a steeply inclined flight upwardly to a succeeding substantially horizontal flight to a discharge point and along return flights to the bottom end of the steeply inclined flight and forming no substantial impediment to flow of air through any of the portions of the screen in the inclined flight and the horizontal flight,
means for driving the screen upwardly along the steeply inclined flight and from the inclined flight along the horizontal flight to the return flights and forming no substantial impediment to flow of air through any of the portions of the screen extending along the inclined flight and the horizontal flight,
a suction box having an opening extending continuously along the inclined flight and the horizontal flight,
means for creating negative air pressure in the suction box of a predetermined magnitude sufficient to hold fragile, discrete particles on the portion of the screen traveling up the inclined flight and on the horizontal flight,
and air-direction means for gradually reducing the magnitude of the negative air pressure applied to the horizontal flight proceeding toward the discharge point to a magnitude substantially lower than said predetermined magnitude at the discharge point.

4. In an elevator for fragile, discrete materials,
an endless screen,
means for guiding the endless screen in a steeply inclined flight upwardly to a succeeding substantially horizontal flight and along return flights to the bottom end of the steeply inclined flight and forming no substantial impediment to flow of air through any of the portions of the screen in the inclined flight and the portion of the horizontal flight adjacent the inclined flight,
means for advancing the screen upwardly along the steeply inclined flight and from the inclined flight along the horizontal flight to the return flights and forming no substantial impediment to flow of air through any of the portions of the screen extending along the inclined flight and the portion of the horizontal flight adjacent the inclined flight,
means for forcing air downwardly through the inclined flight and the portion of the horizontal flight adjacent thereto to press fragile, discrete particles against the portions of the screen in the upwardly inclined flight and the portion of the horizontal flight adjacent thereto,
and means for gradually reducing the magnitude of flow of the air from a predetermined magnitude at the junction of the inclined flight and the horizontal flight to a substantially lesser magnitude at a point on the horizontal flight spaced substantially from the junction of the inclined flight and the horizontal flight.

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SAMUEL F. COLEMAN, *Primary Examiner.*