Feb. 28, 1950 M. I. DORFAN 2,499,301

SUCTION HOOD

Filed Sept. 23, 1948 2 Sheets-Sheet 1

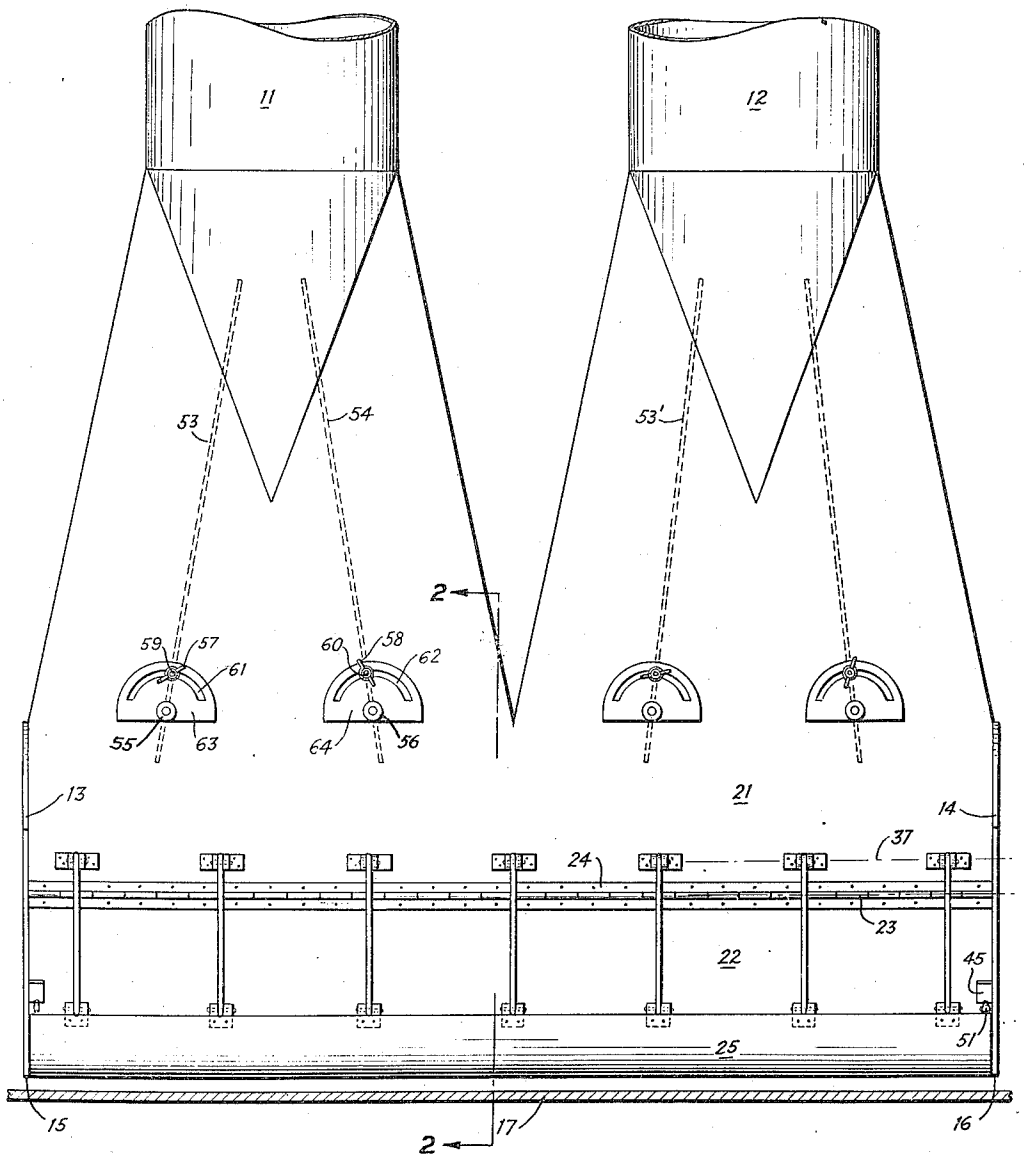

Fig. 1

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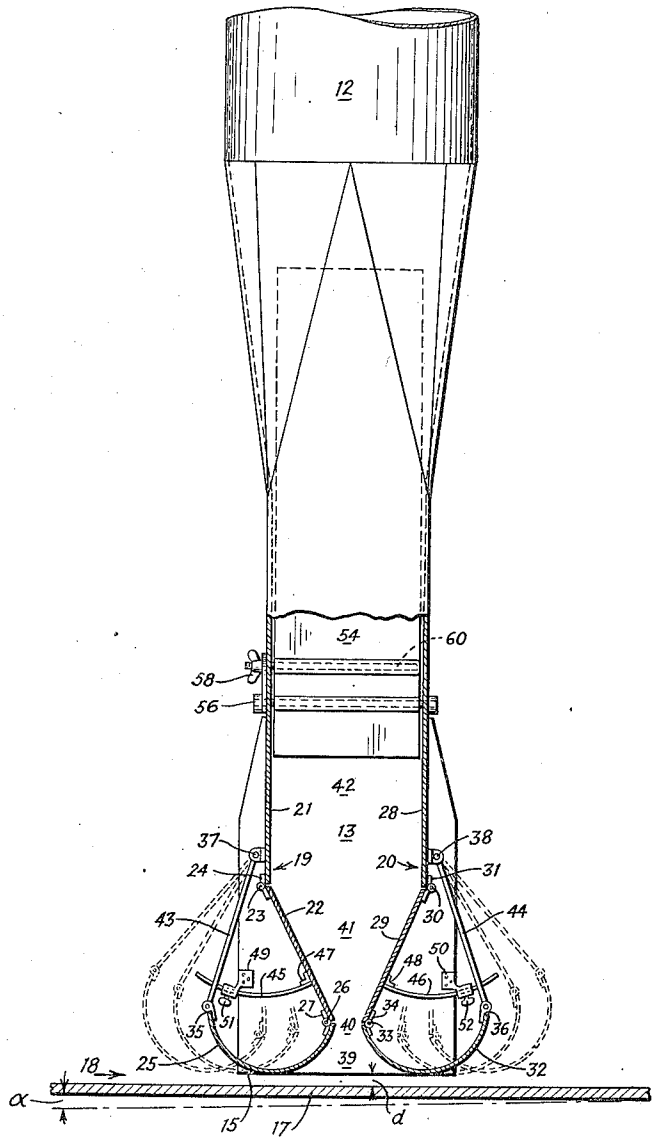

Fig. 2

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SUCTION HOOD

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6 Claims. (Cl. 302—58)

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This invention relates to improvements in pneumatic conveying and dust collecting systems and provides an improved suction hood particularly suited for use as a grading hood incorporating numerous features and advantages which will become apparent from the following description.

Finely divided material such as fibrous or granular materials, for example asbestos fibers, are commonly separated from impurities and graded according to particle or fiber size by a pneumatic grading apparatus in which the material is moved underneath or past a suction hood forming part of a pneumatic conveying system.

A stream of air passing over or through the material and flowing into the grading hood selectively acts on the particles or fibers in picking up and carrying with it particles or fibers up to a certain size, depending on the intensity of the air flow, while leaving larger or heavier particles behind. A similar procedure may be used for the grading of materials which occur in other finely divided states, for example for granular or powdered materials. In every instance, the material to be graded is subjected to the influence of a stream of air or other pressure fluid which carries particles up to a predetermined size with it, while rejecting particles of larger size.

Suction hoods used for grading or other purposes are commonly adjusted for predetermined air volumes or air velocities at the mouth of the hood by raising or lowering the hood with respect to the surface supporting the material to be graded, for example a vibrating table over which the fibers to be graded are fed.

Another conventional manner of adjustment involves throttling of the air flow entering the hood by means of a damper in the air passage extending from the hood.

Bother manners of adjustment are wasteful. When the hood is raised a large percentage of the air flowing into it does not come in contact with, and, hence, does not carry with it, fibers or particles. A damper causes violent turbulence inside the hood and a corresponding loss of energy. In both instances additional energy is lost by reason of the peculiarity of the air stream to form a "vena constricta" reducing the useful cross section of the hood or duct to approximately 71% of its actual size.

The losses thus caused are considerable and appear in terms of additional horsepower required for driving the fans which produce the air flow.

The present invention provides a suction hood of improved construction which is free from the

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aforementioned losses and which, in addition, provides the feature of adjustability for any desired fractional volume of its total capacity. The improved hood is so constructed that even under conditions of reduced flow, an efficient form of passage is maintained so that losses due to turbulence are eliminated. Sudden changes in direction of the flow at the mouth of the hood are also avoided by providing the hood with a suitably shaped lip section.

The various structural and operational features and advantages of this invention as well as its objects will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, a preferred embodiment of the invention. The invention also consists in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the calims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part of it in which:

Figure 1 is a front elevational view of a suction hood leading to two conveyor ducts, and

Figure 2 is a side elevational view, partly in section, of the hood shown in Figure 1, a section being taken on line 2—2 of Figure 1.

In the following description and in the claims, various details will be identified by specific names for convenience. The names, however, are intended to be as generic in their application as the art will permit. Corresponding reference characters refer to corresponding parts in the several figures of the drawings. In the drawings accompanying, and forming part of, this specification, certain specific disclosure of the invention is made for the purpose of explanation of broader aspects of the invention, but it is understood that the details may be modified in various respects without departure from the principles of the invention and that the invention may be applied to other structures than the one shown.

The suction hood shown in Figure 1 is particularly designed as a grading hood serving a plurality of conveyor ducts, such as two ducts 11 and 12. The hood comprises enclosing walls including fixed end walls 13 and 14 whose lower edges 15 and 16 are spaced a predetermined distance *d* above a material supporting surface

17 or may extend below it. The surface 17 may be a vibrating deck or screen panel of conventional construction and is preferably inclined with respect to the horizontal H at any angle, so that divided material slowly advances over the table surface under the action of gravity when the table is shaken or vibrated, thus passing underneath the hood in the direction indicated by arrow 18.

The enclosing walls of the hood further include side walls 19 and 20. These side walls comprise several articulated sections or portions adapted to be adjusted with respect to one another for the purpose of varying the shape of the passage formed by them.

The side wall 19 comprises a fixed inner side wall portion 21 to which an adjustable intermediate side wall portion 22 is hingedly connected along a hinge axis 23. A piano hinge 24 is preferably used for this purpose for reasons of airtightness.

Similarly, a lip portion 25 is hingedly connected to the intermediate portion 22 along a hinge axis 26, also preferably formed by a piano hinge 27. The lip portion may be of any desired shape, may be plane or curved, but is preferably made of semi-cylindrical curvature to provide a gradual outwardly curving mouth for the hood.

The length of the adjustable intermediate wall portion 22 and of the lip portion 25 is such that these wall portions fit reasonably snugly with their side edges between the end walls 14 and 15 so that no undue air leaks exist along the side edges.

The opposite side wall 20 comprises a fixed inner side wall portion 28 to which an intermediate side wall portion 29 is hinged along a hinge axis 30, preferably formed by a piano hinge 31. A lip portion 32 is hingedly connected to the intermediate side wall portion 29 along a hinge axis 33, also preferably formed by a piano hinge 34.

The lip portions 25 and 32 are so mounted that their lowermost portions remain substantially in a plane parallel to the material supporting surface or deck 17 when the intermediate side wall portions 22 and 29 are swung towards or away from each other about their hinge axes 23 and 30, respectively. In a construction employing curved lip portions 25 and 32, as shown in the drawings, this is conveniently accomplished by supporting the far edges 35 and 36 of the lip portions for movement along a predetermined path, for example for swinging movement about pivotal axes 37 and 38. The radius, that is the distance between the pivotal axes and the respective edge 35 and 36 as represented by radius rods 43 and 44 is so selected with respect to the distance between the axes 23, 27 and 30, 33, respectively, that the lowermost portions of the lip sections 25 and 32 remain in substantially a plane parallel to that of the deck or surface 17. This plane, in the illustrated embodiment, is the plane tangential to the curved lip portion 25 or 32. The distance d between the mouth of the hood and the deck or surface 17 remains unchanged for the various positions of adjustment of the side wall portions of the hood.

As Figure 2 clearly shows, the adjustable walls of the hood provide an entrance passage of Venturi shape and Venturi flow characteristics. An entrance or mouth portion 39 narrows gradually towards a throat portion 40, and thence gradually widens at 41 towards a further portion of the duct 42 which is substantially rectangular and of constant cross-section and gradually changes into the circular cross sections of the ducts 11 and 12.

Suitable mechanism is provided for arresting the wall portions of the hood in any predetermined position of adjustment. In the illustrated form of apparatus, this mechanism comprises curved bars 45 and 46 secured to the intermediate side wall portions 22 and 29 at 47 and 48, respectively. The adjustment bars may be frictionally clamped to brackets 49 and 50 by bolts 51 and 52.

Several positions of adjustment of the side walls 19 and 20 are indicated in broken lines in Figure 2. It is apparent that in all positions of adjustment abrupt changes in the direction of flow of air entering the suction hood are prevented and that the hood retains the characteristic form of a Venturi passage, whereby losses due to formation of a vena constricta are prevented. Throughout the range of adjustment freedom from turbulence is maintained and, correspondingly, efficient operation is insured.

Adjustable vanes 53 and 54 may be mounted inside the hoods for the purpose of distributing the entering air evenly over the cross section of the hood and of the attached conveyor ducts 12 and 13. These vanes are pivotally mounted at 55 and 56 and may be moved to and arrested in, any desired angular position by wing nuts 57 and 58 on bolts 59 and 60. The bolts 59 and 60 extend through arcuate slots 61 and 62 in quadrants 63 and 64 against which the wing nuts are tightened.

The invention thus provides an improved suction hood offering many features and advantages. The hood is simple of construction, relatively inexpensive to manufacture and is simple to maintain, adjust and operate.

Its flow characteristics are particularly favorable in that changes in the flow passing through the hood do not affect or reduce the efficiency of the hood as distinguished, for example, from damper control hoods where turbulence of air is set up at the point of greatest restriction leading to power losses.

In addition, greatest efficiency is maintained by avoiding raising and lowering of the hood with respect to the material supporting table or surface and by installing the hood at an optimum distance d which is so selected that the entire volume of air entering the hood passes through, or agitates, the material particles to be graded. Thus the entry of idle air as, for example in the case of a raised hood, is prevented and a corresponding amount of power is saved.

Installation of the improved suction hood in existing installations leads to a considerable increase in efficiency.

In a typical installation employing damper controlled grading hoods, one hundred eighty tons of air per hour were required to pick up and convey ten tons of asbestos fibers per hour. Installation of the improved suction hoods embodying the invention reduced the air requirement by approximately one-third, to less than one hundred twenty tons, resulting in a corresponding saving in power. Since power is a continuous expense in installations of the aforementioned kind, a saving of power of the order of twenty-five per cent through installation of improved suction hoods results in a very substantial saving.

Simplicity of construction and ease of adjustment are further features distinguishing the invention over conventional structures.

Obviously, the present invention is not restricted to the particular embodiment or form of construction herein shown and described. There-

fore, numerous modifications, additions, omissions, substitutions and other changes may be made without departing from the spirit and the essence of the invention.

What is claimed is:

1. A suction intake for pneumatic conveying ducts, comprising a material supporting surface; and a suction hood spaced from said surface, the hood including enclosing side walls so disposed with respect to one another as to provide a Venturi shaped intake passage normally having an outer portion adjacent said surface converging towards a narrower throat and having a divergent inner portion downstream with respect to said throat, at least one of the walls being adjustable to vary the width of the passage at the throat without substantially changing the spacing between the hood and said surface, whereby the flow through said passage may be controlled.

2. A suction hood for pneumatic conveying ducts, said hood having enclosing side walls at least one of the side walls comprising an inner portion, an intermediate portion hingedly connected to said inner portion and a lip portion hingedly connected to said intermediate portion, said intermediate and lip portions being so adjustable with respect to each other and to said inner wall portion to form a Venturi-shaped passage normally converging towards a throat and diverging on the other side of said throat, whereby the flow through said passage may be controlled by adjustment of the width of the throat.

3. A suction hood for pneumatic conveying ducts, said hood comprising enclosing walls including end walls and side walls, at least one of the side walls being articulated to comprise a fixed inner side wall portion, an intermediate side wall portion hinged to the inner side wall portion and a lip portion hinged to the intermediate portion, said articulated side wall being adjustable with respect to the side wall opposite it to form a Venturi-shaped passage with the remaining walls having a throat portion of variable width at the hinged joint between said intermediate portion and the lip portion.

4. A suction hood for pneumatic conveying ducts, said hood comprising enclosing walls including a pair of opposed fixed end walls and a pair of opposed articulated side walls, each side wall comprising a fixed inner side wall portion, an intermediate side wall portion hinged to the inner side wall portion and an outwardly curved lip portion hinged to the intermediate portion, said articulated side walls being adjustable to form with the end walls a Venturi-shaped passage having a throat portion of variable width at the hinged joint between said intermediate portion and the lip portion.

5. A suction hood for pneumatic conveying ducts, said hood comprising enclosing walls including a pair of opposed fixed end walls and a pair of opposed articulated side walls, each side wall comprising a fixed inner side wall portion, an intermediate side wall portion hinged to the inner side wall portion, and an outwardly curved lip portion hinged with one end to the intermediate portion; means for hingedly supporting the other end of said lip portion at a radius so selected with respect to the length of said intermediate portion that the plane tangential with respect to said curved lip portions remains substantially unchanged when said intermediate wall portions are moved towards, or away from each other; and means for arresting said intermediate wall portions in adjusted position, whereby a Venturi-shaped passage is formed having a throat of variable width controlling the flow through said passage.

6. A suction hood for pneumatic conveying ducts, said hood comprising two substantially parallel end walls; a pair of inner side walls extending between said end walls; a pair of intermediate side walls hingedly connected to said inner side walls and movable towards and away from each other between said end walls; a pair of semi-cylindrically curved lip portions hingedly connected with one side edge to said intermediate side walls and extending substantially from one end wall to the other; means for supporting each lip portion for movement of its opposite side edge along a path such that the plane tangential with respect to said curved lip portions remains substantially unchanged when said lip portions are moved towards or away from each other; and means for arresting said lip portions in adjusted positions, whereby the width of the passage defined by said end walls and lip portions may be varied.

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