Oct. 31, 1967 M. L. STRYDOM 3,350,140

CONVEYING SLAB-SHAPED ARTICLES

Filed May 11, 1966 2 Sheets-Sheet 1

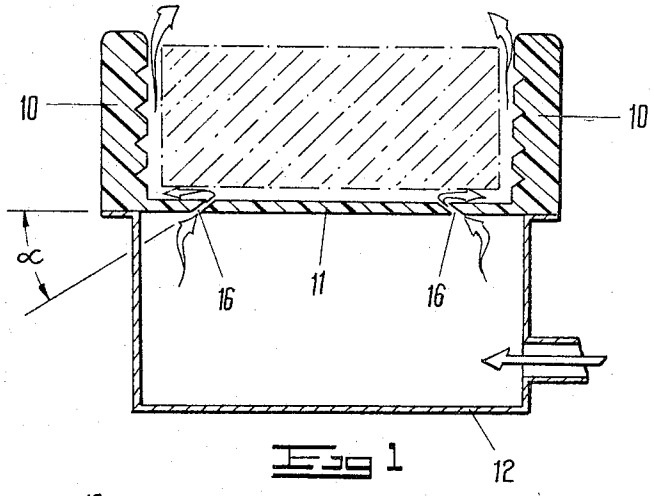

Fig 1

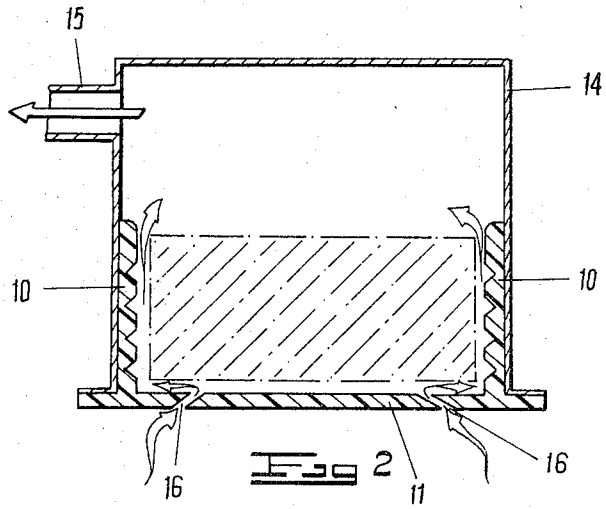

Fig 2

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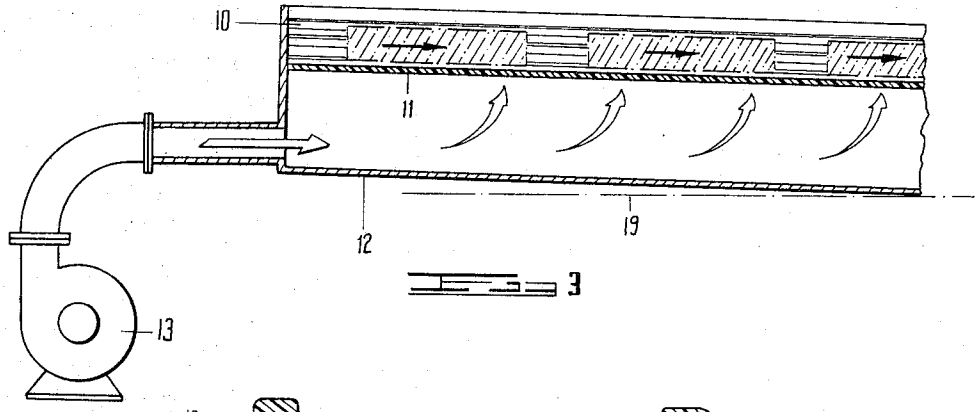

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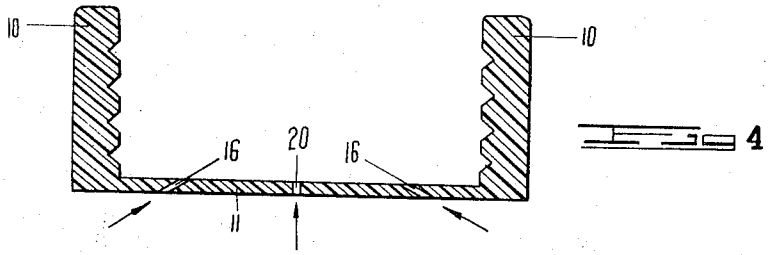

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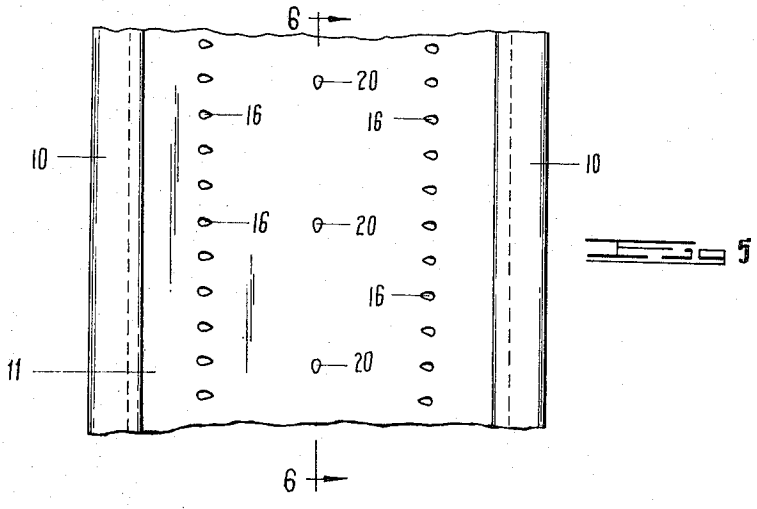

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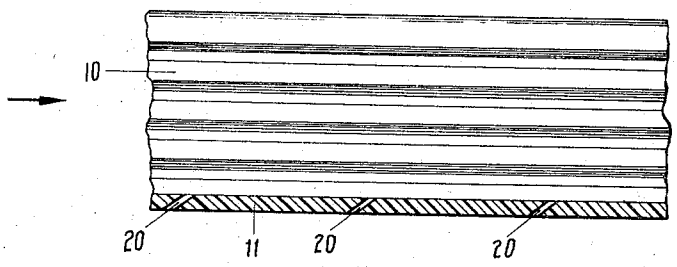

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United States Patent Office 3,350,140
Patented Oct. 31, 1967

3,350,140

CONVEYING SLAB-SHAPED ARTICLES

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Filed May 11, 1966, Ser. No. 549,370
10 Claims. (Cl. 302—31)

ABSTRACT OF THE DISCLOSURE

A conveyor in which slab-shaped articles are conveyed in a trough on a cushion of air caused by the passage of gas through jets in the floor of the trough and in which the jets are provided in two parallel rows and the jets in each row are inclined towards the other row at an angle causing amplification of cushion pressure.

This invention relates to the conveyance of slab-shaped articles. In this context a slab-shaped article is one which has at least one generally flat surface which can serve as an underside. In the preferred form of the invention the article has at least two parallel sides at fixed angles to the generally flat underside. In practice the articles are usually rectangular prismatic boxes or cartons.

It has already been proposed to convey slab-shaped articles by supporting them off the base of a trough by a cushion of gas created by inducing gas flow between the generally flat surface and the base through the latter. An example of a prior proposal is to be found in U.S. patent specification No. 2,805,898. In practice it has been found that with the proposals of this U.S. patent specification the air consumption is relatively speaking very large. Note that in this case provision is made for keeping the articles to be conveyed off the side walls of the trough in the form of jets through the side walls, which further increases the air consumption.

Another proposal of this kind is to be found in U.S. patent specification No. 3,180,688. In this case in addition to the cushion of air, air is used to propel articles along the conveying surface. No provision is made at the side walls so that fragile articles may be damaged by impact or a line of articles may get jammed between the side walls. In this case also the air consumption is relatively large.

An object of the invention is to provide a system in which the air consumption is reduced. Another object of the preferred forms of the invention is to provide an improved system for centralizing articles in a conveying trough.

In a system of the kind discussed the invention provides the improvement that the jets are provided in two rows parallel to the side walls and the jets in each row are inclined towards the other row at an angle causing amplification of the cushion pressure.

The invention is further discussed below with reference to the accompanying drawings, in which:

FIGURE 1 is a section through a conveying trough according to the invention,

FIGURE 2 is a section through another form of the invention,

FIGURE 3 is a longitudinal section through part of a system,

FIGURE 4 is a section through a modification having propulsion jets,

FIGURE 5 is a plan view of the modification of FIGURE 3, and

FIGURE 6 is a section on the line 6—6 in FIGURE 5.

In FIGURES 1 and 2 the essential parts of the invention are the same. There is a trough composed of side walls **10** and a base **11**. The side walls **10** are corrugated as shown with the corrugations running parallel to the base **11**.

In FIGURE 1 the base **11** is mounted on top of a wind box **12** which is supplied with compressed air from any suitable source such as the fan **13** shown in FIGURE 3. In FIGURE 2 the trough is itself part of a box **14** which is connected through an outlet **15** to a suitable source of suction.

The base **11** is pierced by two rows of jets **16** which rows are parallel to the side walls **10**. The improvement provided by the invention is that the jets **16** in each row are inclined to the jets in the other row, as shown. The angle of inclintaion α is important. The angle should be such that there is amplification of the cushion pressure. Since the jets cannot extend peripherally around an article being conveyed, there cannot be full amplification, but only a partial amplification. The formulae for calculating amplification are not applicable in this case so that the best angle has to be determined by experiment. The applicant has found that in its work angle of 28° gives the best amplification factor.

In one example of the invention a system according to FIGURES 1 and 3 was built. The trough was about 106 meters long. The base **11** was about 3 mm. thick, was made of PVC and was pierced by two parallel rows of jets each row opening up about one quarter of the width of the trough from the side walls **10**. The jets were 0.05 millimeter in diameter and spaced 5 mm. apart along the length of the conveyor in each row. The articles **17** conveyed were cartons containing 200 cigarettes and being about 6 mm. narrower than the width of the trough.

In order to obtain a forward thrust along the conveyor the trough was sloped in the direction of travel at an angle of 20 minutes. Air at 50 mm. water gauge was fed into the wind box **12**. In this conveyor an article to which no external forward thrust was imparted reached a speed of 1.2 meters per second after about 10 meters.

When the conveyor was used to convey articles on a regular basis, the air consumption was about 40 cubic meters per minute. On a similar system using jets which were vertical or relied only on their vertical component to create an air cushion, the air consumption was estimated to be 10 times as much.

It appears that the corrugations in the side walls **10** of the trough have several advantages. Finally it seems that the corrugations in that they provide a labyrinthine seal also conserve air and lead to less air consumption.

In the regular operation mentioned above, no two cartons collide and the articles never touch the side walls **10**. Absence of collision takes place whether the side walls **10** have corrugations or not, but the effect seems to be enhanced by the corrugations since more air tends to escape at the two ends of the articles. This additional air escape is a secondary result of the labyrinthine seal formed by the corrugations.

In the example, forward thrust was obtained by sloping the trough as shown in FIGURE 3 where the chain line **19** represents the horizontal. Note that the angle between the horizontal and the trough should be 20 minutes or more.

It is possible to use a system of air jets on a perfectly horizontal conveyor. This is illustrated in FIGURES 4 to 6. In this case there are propulsion jets **15** between the rows of cushioning jets **16**, say, 2.5 cm. apart and inclined towards the direction of travel at an angle of, say 25°. It is estimated that the jets **20** will increase air consumption by about 5%.

Mechanical pushers at intervals along the length of the conveyor can also be used.

I claim:

1. A pneumatic system for conveying slab-shaped articles consisting in an elongated trough having a base and parallel side walls flanking the base, jets piercing the base and means to cause gas to flow through the jets, so that each article floats on a cushion of gas created by gas flow

between the bottom of the article and the surface of the base, having the improvement that the jets are provided in two rows parallel to the side walls and the jets in each row are inclined towards the other row at an angle causing amplification of cushion pressure.

2. The system claimed in claim 1 in which the angle is of the order of 28 degrees to the surface of the base.

3. The system claimed in claim 2 in which the jets pierce the base at points spaced from the nearest side wall at about a quarter of the distance between the side walls.

4. The system claimed in claim 1 in which the side walls are corrugated with the axes of the corrugations parallel to the base.

5. The system claimed in claim 4 in which the angle is of the order of 28 degrees to the surface of the base.

6. The system claimed in claim 5 in which the trough is downwardly inclined at an angle of at least 20 minutes in the direction of travel of articles to be conveyed.

7. The system claimed in claim 4 in which the jets pierce the base at points spaced from the nearest side wall at about a quarter of the distance between the side walls.

8. The system claimed in claim 1 in which the jets pierce the base at points spaced from the nearest side wall at about a quarter of the distance between the side walls.

9. The system claimed in claim 1 in which the trough is downwardly inclined at an angle of at least 20 minutes in the direction of travel of articles to be conveyed.

10. The system claimed in claim 1 including a series of propulsion jets inclined in the direction of travel.

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