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(54) APPLICATOR FOR FLOWABLE REACTION COMPOSITIONS

(71) We, METZELER SCHAUM G.m.b.h., a body corporate organised under the laws of Federal Republic of Germany, of 8940 Memmingen, Donaustraße 51, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The information relates to applicators for flowable and foamable reaction compositions.

Applicators for applying foamable reaction mixtures on to a conveyor belt in the form of vertical down pipes having at their lower openings guide means running obliquely to the belt are known from German Gebrauchmuster No. 1887941. With these applicators, the flow of the reaction composition is emmited in the direction of travel of the belt but it disperses outwards in the form of an opening wedge so that portions of the charged reaction composition which flow outwards remain behind the reaction compositions charged in the centre of the conveyor belt. This causes the outer portions of the charged reaction composition to foam at a location upstream of the central portion of the reaction composition charged at the same time. This may give rise to differences in density in the foam being formed which lead to tension and tear formations in the foam.

It is also known to reciprocate the down pipe transversely to the direction of travel of the conveyor belt during application of the reaction composition. This type of application leads to a zig-zag application so that reaction compositions in differing stages of reaction meet at the respective turning points. This type of application is also accompanied by the risk of inhomogeneous foam structures being formed.

The present invention relates to an applicator for flowable reaction compositions which allows uniform application of the reaction composition on to the conveyor belt over the entire belt width so that only reaction compositions in the same stage and of the same composition start foaming, as viewed over the entire cross-section.

According to the invention there is provided an applicator for a flowable and foamable reaction composition for the production of polyurethane foam, comprising a bar which comprises two tubes positioned concentrically and spaced apart, and at least one supply pipe which opens radially at a junction into a chamber defined by the inner one of the tubes, the inside diameter of the said chamber decreasing as the distance from the said junction increases, the said inner tube having at the highest region thereof overflow openings which permit the passage of the reaction composition into a chamber defined between the inner and outer tubes, the cross-section of the overflow openings increasing as the distance from the said junction increases, the outer tube being provided at its lowest region with at least one continuous slit-shaped outlet opening.

The reaction composition passes from a mixing chamber via a central inlet into the inner chamber and, from there, through the overflow openings into the outer chamber and thence through the outlet opening or openings at the lower end of the outer wall.

The internal width of the outer chamber is smaller than the diameter of the inner chamber. The ratio of the internal width of the outer chamber to the diameter of the inner chamber is preferably from 1:5 to 1:20, more preferably about 1:10. In a preferred embodiment, for example, the maximum diameter of the inner chamber is about 50 mm (without taking into consideration the conical contractions at the outer end parts) and a maximum width of the outer chamber of about 5 mm.

In order to ensure that reaction composition at an equally advanced stage of reaction

is always charged over the entire length of the inner chamber, the internal width of the inner chamber decreases as it moves further away from the respective inlet. The internal width may be reduced by wedge-shaped inserts or by a conical design of the inner chamber so that part of the lower inner chamber is filled. The upper surface of each insert is preferably horizontal. At the end of the inner chamber, the wedge only leaves about 10 to 20% of the cross-sectional area of the inner chamber for the influx of the reaction composition.

The internal width of the overflow openings increases as the distance from the respective inlet increases. The overflow openings in the internal wall may for example, be from 4.5 to 5 mm in an inner chamber having a diameter of about 50 mm and an outer chamber having a radial width of about 5 mm. In this way, the reaction composition flows faster in the end of the tubes than in the inlet section. This ensures that reaction compositions at an equally advanced stage of reaction issues from all overflow openings at the same time and enters the outer chamber which preferably has a constant cross-section. The reaction composition is fed to the bar of the mixing unit via one or more inlets. If there is a central inlet as a connecting piece between the mixing unit and the inlets, the cross-section of the central inlet is generally equal to the sum of the cross-sections of the inlets.

An embodiment of the apparatus according to the invention is provided with a flexible apron to prevent the reaction composition flowing out of the outlet openings backwards behind the applicator. This applies particularly when the reaction mixture is charged on to a horizontal conveyor belt and not on to a conveyor belt which is slightly inclined.

The invention is described in more detail below with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic side view of an apparatus for the production of foams;

Fig. 2 is a diagrammatic front view of the apparatus of Fig. 1;

Fig. 3 is a cross-section through an applicator according to the invention;

Fig. 4 is a section along line I—I in Fig. 3; and

Fig. 5 is a section along line II—II in Fig. 3.

The apparatus shown in Figs. 1 and 2 comprises a conveyor 9 which is illustrated in the form of a conveyor belt. A double conveyor belt is preferably used when producing rigid foam. Lateral covers 15 are provided for greater plate strength. The reaction components are fed from containers 16 to a central inlet 11.

As shown in Fig. 3, the central inlet 11 divides in the applicator into two equally long and equally wide inlets 1. A control valve 12 is connected at the location where the inlets 1 branch off from the central inlet. The inlets 1 are connected to a transverse bar 17 by means of couplings so that the openings of the inlets 1 end in an inner chamber or cavity 18 of the transverse bar. The transverse bar which provides uniform application of the reaction composition over the entire width of the conveyor belt is sealed laterally by covers 4 which are preferably detachable. The inner cavity 18 is separated from an outer chamber or cavity 10 by an inner wall 3 provided with overflow openings 8. The openings, which are designed as passages in the shape of holes and/or slits whose diameters increase as the distance from the inlets increases, are located at the top of the internal wall 3 of the transverse bar. Lateral wedges 5 each of which diverge outwards and a central double wedge 6 which converges outwards, are arranged in the inner cavity 18 and cause the cross-section of the inner cavity to decrease as the distance from the respective inlets increases.

Fig. 4 shows a section through the transverse bar 17 in the region of the wedge 5. The wedge is, for example, about 8 mm high at this point and the cavity has, for example, a remaining cross-section of about 42 mm at this point. The outer wall 2 of the transverse bar encloses the outer cavity 10 between itself and the inner wall 3. The outer wall 2 of the transverse bar has at its bottom a slit-shaped outlet opening 7 which is continuous. The outer cavity 10 is fed with reaction composition from the inner cavity through the overflow openings 8. The outlet opening 7 in the outer wall 2 is preferably arranged obliquely in the outlet direction.

Fig. 5 is a section through the transverse in the region of the central wedge 6. The section does not pass through one of the upper overflow openings in this case. A flexible apron 13 is so arranged in relation to the outlet opening 7 as to prevent possible backflow of the reaction composition downstream of the applicator. This is particularly important if the conveyor belts are arranged horizontally.

The applicator according to the invention for flowable reaction compositions allows reaction compositions of equal age to be applied simultaneously over the entire width of the conveyor belt. The production of a foam block or a foam plate having a composition which is uniform over the entire cross-section is thus ensured. The apparatus also allows a very rapid change of colour if the colour of the reaction compositions is to be changed during continuous application. The applicator according to the invention also allows the recipe of the composition to be changed rapidly during continuous applica-

tion of the reaction composition on to the conveyor belt since old reaction composition is rarely mixed with new reaction composition when using an applicator according to the invention.

The applicator according to the invention, also has the advantage that it does not tend to block because the reaction compositions are ejected in the interior of the transverse bar in each case owing to the differing cross-sections of the two cavities. It is also significant that the overflow openings which connect the inner cavity to the outer cavity are arranged at the highest point of the inner wall. This ensures that reaction composition which may foam prematurely, for example, during the application of foam reaction composition, is always ejected from the inner cavity and that parts of the reaction composition are not cured therein. The applicator can be used for the continuous production of polyurethane foams of the flexible, semi-rigid and rigid type. The conventional double conveyor belts ae preferably used during the production of rigid foam blocks and plates.

WHAT WE CLAIM IS:—

1. An applicator for a flowable and foamable reaction composition for the production of polyurethane foam, comprising a bar which comprises two tubes positioned concentrically and spaced apart, and at least one supply pipe which opens radially at a junction into a chamber defined by the inner one of the tubes, the inside diameter of the said chamber decreasing as the distance from the said junction increases, the said inner tube having at the highest region thereof overflow openings which permit the passage of the reaction composition into a chamber defined between the inner and outer tubes, the cross-section of the overflow openings increasing as the distance from the said junction increases, the outer tube being provided at its lowest region with at least one continuous slit-shaped outlet opening.

2. An applicator accoring to claim 1 wherein the or each outlet opening penetrates the outer tube obliquely.

3. An applicator according to either preceding claim, wherein the internal width of the chamber between the inner and outer tubes is smaller than the diameter of the chamber within the inner tube.

4. An applicator according to any preceding claim, wherein the said bar is sealed at each lateral end by a respective cover.

5. An applicator according to any preceding claim, wherein the said decrease in the diameter of the chamber within the inner tube is provided by wedge-shaped inserts or conical contractions.

6. An applicator according to any preceding claim, wherein the or each supply pipe opens into the chamber within the inner tube at a location spaced from a lateral end of the said bar.

7. An applicator according to any preceding claim, wherein the outlet opening or openings is or are provided with a flexible apron.

8. An applicator substantially as herein described with reference to the accompanying drawings.

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1596464 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.2

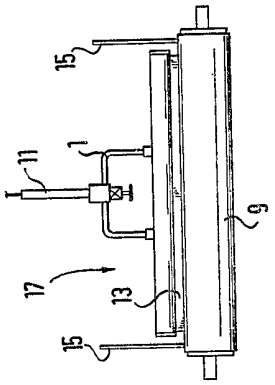
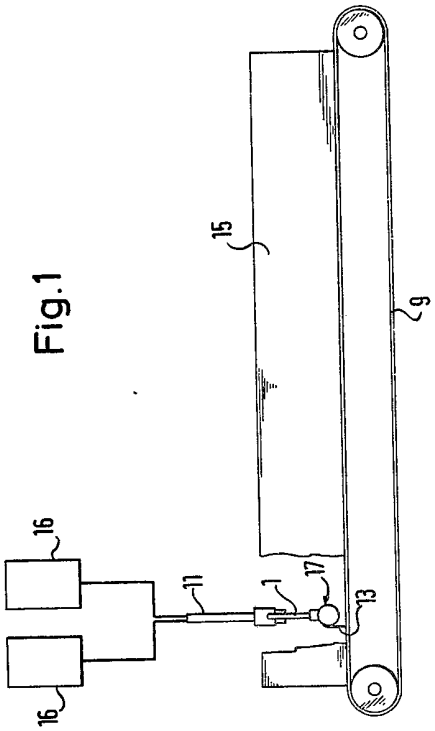


Fig.1



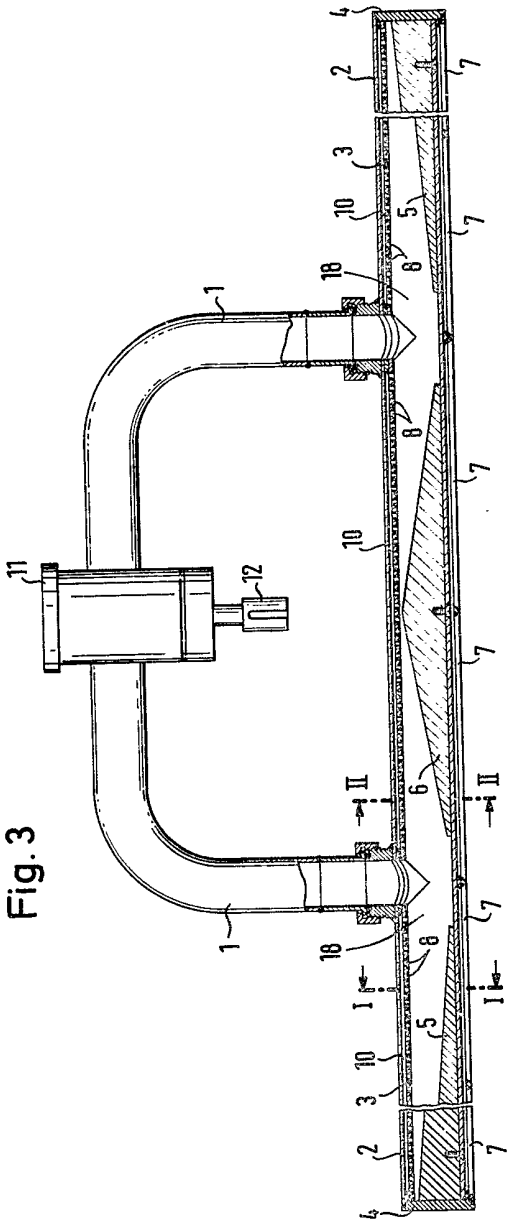


Fig. 3

Fig.4

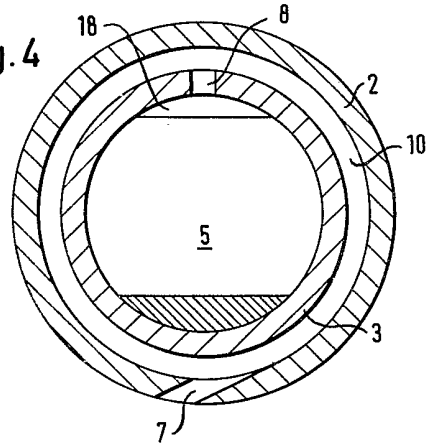


Fig.5