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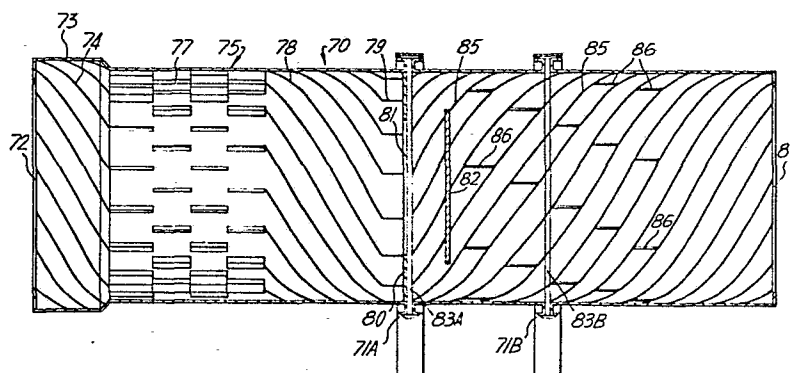
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(54) **Drum for separating bulk goods.**

(57) In a drum for separating bulk goods, for example chopped crops, there are members (10A, 78) for feeding a mixed bulk goods substantially along the wall of the drum towards a barrier (66A, 80) disposed in the drum in front of which the greater part of the bulk goods can gradually be dammed up before it enters a separating portion in the drum. The barrier constitutes a starting point for the separation which is intended to be carried out in the separating portion with air as the main conveying means in the main conveying direction of the goods. One or more outlets (12A) are provided in the wall of the drum after said barrier.

Fig.4.



DRUM FOR SEPARATING BULK GOODS

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TECHNICAL FIELD

The invention relates to a drum for separating bulk goods. More specifically, the invention relates, in particular, to an equipment for treating chopped crops consisting of a mixture of grains and lighter components. The drum comprises at least one discharge opening for heavier goods in the wall of the drum in the separating section, a discharge opening for lighter goods in the far end of the separating portion, and preferably a drying section in front of the separating section.

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BACKGROUND ART

Rotatable drying and separating drums of the kind indicated in the preamble are already generally known. For example, reference may be made to US 2 496 225 and US 2 617 529. In the drums which are shown in these previous patent specifications, the drying section is delimited with respect to the separating section by a flange directed radially inwards, which constitutes a constriction of the passage through the drum. Immediately behind the constricting flange, seen in the conveying direction of the goods, there is a discharge opening in the wall of the drum. The intention is that the lighter components of the bulk goods should be given such a great increase in speed in the region in front of the constriction that they are separated from the heavier fraction and are drawn out through a discharge opening in the end of the separating portion while the heavier fraction falls out through the outlet behind the constricting flange.

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In practice, however, problems arise which cannot be mastered by an equipment of this known kind. In order to prevent that at least some of the heavier fraction, such as grains when the bulk goods consist of chopped crops, should be entrained with the lighter components of the goods and discharged in the far discharge opening, it is necessary to
5 give the separating portion a considerable length and/or to provide it with members for effective separation of the different fractions. A particular problem also arises as a result of the fact that goods from different parts of the drying section, that is to say not only from the
10 region immediately in front of the constricting flange, are entrained by the stream of air and can enter the separating portion. In this manner, the stream of goods inside the separating portion becomes complex meaning i.a. that even particles of the same kind, such as grain, may have quite different velocities when they enter the separation section, which
15 further detracts from the prerequisites for an effective separation.

DISCLOSURE OF INVENTION

The object of the invention is to solve the above mentioned problems in a separating drum of the kind indicated in the preamble.

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In particular, the object, with a combined rotatable drying and separating drum, is to adapt the equipment to the requirements particularly when drying and separating chopped cereals.

25 Another object is to provide an equipment with great capacity, at the same time as a degree of separation of the heavier fraction which normally constitutes the more valuable fraction in the mixture, is very high.

30 These and other objects can be achieved as a result of the fact that the drum is provided with a barrier, for example a constricting flange of the above mentioned kind, known per se. According to the invention, means are provided to feed the mixed crops substantially along the wall of the drum towards said barrier, so that the goods, as a result of the
35 feed substantially along the generated surface, can be forced to stop up

and temporarily accumulate in front of the barrier, before they enter the separating portion to be separated into their fractions. In this case, the barrier can be said to constitute a starting point for the separation which is adapted to be carried out in the separating portion
5 with air as the main conveying means in the main conveying direction of the goods. As a result of the fact that the goods are fed forwards mainly along and in contact with the inside surface of the drum to the barrier, the prerequisite is obtained for a more effective separation with less admixture of goods flowing into the separating portion from
10 other parts of the drying section of the drum or corresponding introductory parts. As a result of the fact that the main portion of the goods which enter the separating portion start substantially from the same point, or so to say "from scratch", the goods of the different fractions also have substantially the same starting speed as one another
15 and consequently come to land inside the section of the separating portion which is clearly defined for the respective fraction.

The feed members in front of the barrier may, for example, consist of screwshaped conveyors at the inside of the drum in the drying section of
20 the drum or the like.

According to a preferred embodiment, one or more outlets are provided in the wall of the drum after said barrier at a distance from this which is selected so that it lies within the region within which the greater part
25 of the heavier fraction, such as grains in a mixture of chopped crops, is intended to land after having passed said barrier. Means for feeding the landed goods backwards towards said outlet then are provided behind said outlet in the wall of the drum.

30 According to a preferred embodiment one or more outlets further, or possibly as an alternative to the first mentioned outlet, are provided in the wall of the drum immediately behind said barrier, behind said outlet/s, feeding means being provided to feed the goods backwards towards the outlet/s. Preferably the entire distance between the two
35 preferably provided outlets or group of outlets is occupied by feeding means provided to feed goods backwards towards the outlet/s behind said barrier.

In order to refine the separation still further, a barrier may also be disposed in the separation portion, in which case this other barrier, in a similar manner to the barrier which delimits the drying section or the like from the separation portion, is surrounded by members on the one
5 hand to feed goods along the wall of the drum towards said other barrier and on the other hand to feed goods, which have passed the barrier, towards a further one or more discharge openings in the wall of the drum at the other side of the barrier. Further barriers and discharge openings in the wall of the drum may, of course, be provided.

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Further features, advantages and objects of the invention are apparent from the following description of two preferred forms of embodiment.

BRIEF DESCRIPTION OF DRAWINGS

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In the following description of the preferred forms of embodiment, reference is made to the accompanying figures of the drawing in which

Fig. 1 constitutes a side view of a drum according to a first form of the embodiment of the invention shown partly in section,

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Fig. 2 shows in more detail how parts in the interior of the drum are formed,

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Fig. 3 illustrates, in the form of a diagram, the principle of the mode of operation of the invention,

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Fig. 4 shows a longitudinal section through the primary drier and the separation section of the drum according to a second preferred embodiment of the invention.

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In the figures, only those parts which are important for an understanding of the principles of the invention are shown, while other parts are omitted so that what is essential may be brought out better.

DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to Fig. 1, the numeral 1 designates a rotatable drum which constitutes an integrated primary drier, threshing mechanism and separating mechanism for chopped cereals. A mixing chamber for drying
5 air is designated by 4. A feed pipe 5 is adapted to feed the chopped but otherwise untreated crops into a primary drier 6 which is connected to a separating section 7. In the separating section 7 there is a first and a second outlet device 8A and 8B respectively for grains in the region in front of a first and a second annular outlet 12A and 12B respectively in
10 the wall of the drum 1. The outlet devices including the outlets are of the kind described in more detail in the U.K. Patent Application No. 81 00989 filed by the same applicant and entitled "Device for a rotatable drying and separating drum", which application is hereby incorporated in the present text.

15 The primary drier 6 and the separating section 7 together form the coherent, rotatable drum 1 which has a horizontal axis of rotation. The drum 1 is adapted to be rotated by a drive motor 61 about the horizontal axis of rotation. The drum 1 rests against a plurality of rollers 62
20 which are supported by a base 64 via bearing brackets 63. The pipes for introducing drying air into a mixing chamber 4 are designated by 54 and 55, while a lock for crops is designated by 13. Disposed in the discharge end of the drum 1 is an outlet box 14 for straw, chaff and other lighter components of the crops. The outlet devices 8A and 8B for grains
25 are connected, via locks 34A and 34B and pipes 9A and 9B, to a grain drier not shown. Further disposed above the locks 34A and 34B are supply pipes 10A and 10B respectively for introducing air into the outlet devices 8A and 8B. A damper in the supply pipe 10A and 10B respectively is designated 11A and 11B.

30 The primary drier 6 is provided, at the inside of the drum 1, with lifting laminations 65 in the form of straight pieces of sheet metal directed radially inwards. In the end portion of the drying section 6, however, the drum is instead internally clad with spiral threads 10A
35 consisting of sheet-metal strips twisted into spiral shape and directed radially inwards and welded to the inside of the drum 1. The drying

portion 6 is terminated by a short section of conveyors 68A. These may consist of lifting laminations directed radially inwards of the same kind as the laminations 6 but with a shorter axial extent. Alternatively or additionally, conveyors may be provided in the form of radially directed pins which, on rotation of the drum, can lift up straw components for preference and permit grains or other small particles to pass between the pins and on directly over the edge of the constricting flange into the separating portion. The short section of conveyors 68A is disposed immediately in front of the first constricting flange 66A.

Referring in parallel to Fig. 3, this illustrates diagrammatically that the homogeneously mixed bulk goods in the drying portion 6 in the region in front of the straight lifting laminations 65, tumble around in the drum 1 - section A in the diagram. The distribution of goods in the axial direction is substantially uniform. In the region in front of the spiral threads 10A - section B - the goods are fed at high speed forwards towards the constricting flange 66A to accumulate in front of the constricting flange - section C - before they are lifted up by the conveyors 68A to enter the separating portion 7. If the conveyors 68A comprise inwardly directed pins, these exert a greater lifting effect on the straw components in the goods than on other components so that the former have a higher starting height than the grains before they pass into the separating portion 7. Whatever kind of lifting conveyor 68A is used, however, the result is obtained that the heavier components of the accumulated goods C in front of the constricting flange 66A come to land near the constricting flange, at the back of this - amount D in the diagram - while straw and other lighter components land further away in the separating portion - amount E.

In order to utilize the possibilities afforded by the above mentioned conditions, the first outlet 12A in the wall of the drum 1 is disposed at such a great distance behind the first constricting flange 66A that a considerable proportion and normally more than half of the heavier fraction - the grains C - come to land between the constricting flange

66A and the outlet 12A after having passed the constricting flange 66A. Nevertheless some lands further away.

In order to feed the grains D to the outlet 12A, the drum 1 is provided
5 at each side of the outlet 12A with spiral-shaped members - screws - 18A
and 19A adapted, on rotation of the drum 1, to feed preferably grains D
forwards or backwards towards the outlet 12A. In order to prevent straw
components from also being driven forwards or backwards to the same
extent by the screws 18A and 19A, a row of pins 20A and 21A is disposed
10 in front of the screws - seen in the feed direction. The pins may also
be disposed in another manner, for example in straight rows between the
adjacent screws 18A and 19A respectively. Alternatively, it is also
conceivable to dispose the pins more or less at random. The pins work so
that they primarily lift up the straw components on rotation of the drum
15 while the grains can substantially pass through. When the straw then
falls down, it is caught by the stream of air and is driven forwards in
the drum while the grains are exposed to a considerably lesser extent to
the driving action of the air but instead are driven by the screws 18A
and 19A from both directions towards the outlet where they are dischar-
20 ged. A final separation of chaff and other lighter particles also takes
place in the opening 12A through an oppositely directed stream of air
through the opening. In the diagram in Fig. 3, the feed direction of the
screws is indicated by filled-in arrows and the feed direction of the
air in the various sections by non-filled-in arrows. The formation of
25 the screws 19A feeding backwards and the pins 21A cooperating therewith
is shown in more detail in Fig. 2. The screws 18A are similarly formed
but threaded with the opposite hand.

Nevertheless, a certain number of grains inevitably accompany the straw
30 forwards in the drum 1 towards the further parts of the separating
portion 7. In order to take care of these grains also, another outlet
12B is provided. At both sides of the outlet 12B there are screws 18B,
19B which feed forwards and backwards respectively, and pins 20B, 21B.
Another constricting flange 66A, spiral feeder 10B and lifting conveyors
35 68B are also provided in front of the constricting flange 66B. All these

parts have the same formation as the corresponding parts described above with the index A. The accumulation primarily of straw in front of the second constricting flange 66B is designated by F in Fig. 3, the separated grain fraction is designated by G, while the straw which is now conveyed further to the outlet box 14 is designated by H. It should be understood that Fig. 3 is only intended to illustrate the principles of the present inventive idea and that the diagram does not claim to show the actual conditions inside the drum true to scale or in an absolute manner.

The drum 70 shown in Fig. 4 constitutes an integrated primary drier, threshing mechanism and separating mechanism for chopped cereals. The drum 70 thus has a horizontal axis of rotation and is provided to be rotated by a drive motor (not shown) about the horizontal axis of rotation. Nor have supporting rollers, bearing brackets or the base been shown in the figure. These details, however, may be similar to those which have been shown with reference to the preceding embodiment. For these details reference therefore is made to the disclosure of the preceding embodiment. In Fig. 4 nor have been shown the conduits for supplying drying air or for the supply of the bulk goods into the drum 70 as well as the devices at the discharge side, that is to say the outlet box for straw and other lighter components. Further two discharge devices 71A and 71B have been shown only schematically. All these details may be of the same kind as have been described with reference to the preceding embodiment.

At the entrance side of the drum 70 there is an inlet opening 72 to an inlet portion with feed means in the form of helical strips along the wall of the drum, provided to feed the goods towards a primary drier 75. The separation section has been designated 76.

The primary drier 75 is provided, at the inside of the drum 70, with lifting laminations 77 in the form of bent pieces of sheet metal. In the end portion of the drying section 75, however, the drum is instead internally clad with spiral threads 78 consisting of sheet-metal strips

twisted into spiral shape and directed radially inwards and welded to the inside of the drum 70. The drying portion 75 is terminated by a short section of conveyors 79. These may consist of lifting laminations directed radially inwards of the same height as the spirals 78 and with a shorter axial extent than the laminations 77. The short section of conveyors 79 is disposed immediately in front of a constriction flange 80. At a distance behind the constriction flange there is provided a central deflection device in the form of a circular sheet disc 82.

Immediately behind the constriction flange 80 there is provided a first circumferential outlet 83A in the region of the discharge device 81A. In the region of the second discharge device 71B there is provided a second outlet 83B, which is provided at a distance from the first discharge device 83A corresponding to the distance between the first discharge device 12A and the constriction 66A according to the preceding embodiment with reference taken to the distribution of the heavier fraction D according to Fig. 3. In the rear end of the drum 70 there is a discharge opening 84 for the lighter fraction of the bulk goods. Along the entire distance from the constriction flange to the discharge opening 84 the inside of the wall of the drum is clad with spirals 85 provided to feed the bulk goods backwards towards the two outlets 83A and 83B. Further there are between the spirals 85 along the major portion of this distance, see the figure, lifting devices which according to the embodiment consist of axial and radially directed sheet metal pieces 86 with the same height as the spiral shaped feed means 85.

The operation of the drum shown in Fig. 4 is the same as according to the preceding embodiment until the barrier for the bulk goods formed by the constriction flange 80. When the goods have passed through the central opening 81, they will, however, according to this second embodiment, meet the central disc 82 which deflects the goods outwards towards the periphery of the drum. The bulk goods thus are caused to change their direction which brings about a separation effect. Further the bulk goods are caused to accelerate in the region between the disc 82 and the wall of the drum, that is in the region adjacent to the first outlet

83A, and in this acceleration the lighter parts of the bulk goods, such as straw and chaff, are more readily carried away by the air flow than the grains. This means that while the majority of the grains will land between the two outlets 83A and 83B, the majority of the straw will
5 safety be carried away from the vicinity of the first outlet 83A and land behind the second outlet 83B or at least so far away from the first outlet 83A that straw to a considerable extent will not have sufficient time to be fed backwards by the feed means 85 before any of the lifting means 86 will lift up the straw and let it allow to fall down into the
10 air flow and again be conveyed towards the discharge opening 84.

CLAIMS

1. A drum for separating bulk goods with members for rotating the drum and for blowing air through the drum in the direction in which the goods are conveyed through the drum, which drum comprises a separating portion to separate a heavier fraction of the bulk goods, a discharge opening for the lighter components of the bulk goods in the far end of the separating portion and at least one outlet for the heavier fraction in the wall of the drum in the separating portion, c h a r a c t e r i - s e d by members (10A, 78) for feeding the mixed bulk goods mainly along the wall of the drum towards a barrier (66A, 80) which is disposed in the drum and in front of which the main portion of the bulk goods can be dammed up before it enters the separating portion, said barrier constituting a starting point for the separation which, in the separating portion, is adapted to be carried out with air as the main conveying means in the main conveying direction of the goods.

2. A drum as claimed in Claim 1, c h a r a c t e r i s e d in that said members (10A, 78) for feeding the mixed goods towards said barrier consist of screw-shaped conveyors at the inside of the drum.

3. A drum as claimed in Claim 1, c h a r a c t e r i s e d in that one or more outlets are provided in the wall of the drum after said barrier at a distance from this which is selected so that it lies within the region within which the greater part of the heavier fraction, such as grains in a mixture of chopped crops, is intended to land after having passed said barrier.

4. A drum as claimed in Claim 3, c h a r a c t e r i s e d by feed members (19A, 85) behind said outlet (12A, 83A, 83B) in the wall of the drum, adapted to feed the goods which have fallen down backwards towards said outlet.

5. A drum according to Claim 4, c h a r a c t e r i s e d in that feed means (18A) in front of said outlet/s (12A) are provided to feed the goods which have fallen down forwards towards said outlet/s.

6. A drum according to Claim 4, c h a r a c t e r i s e d in that one or more outlets (83A) are provided in the wall of the drum immediately behind said barrier (80), feed means (85) being provided between this outlet/s in order to feed the goods backwards towards the outlet/s, and
5 that preferably the entire distance between the two preferably provided outlets (83A, 83B) or groups of outlets is occupied by feed means (85) provided to feed goods backwards towards the outlet/s behind said barrier.
- 10 7. A drum according to one of the Claims 1-6, c h a r a c t e r i s e d in that a central deflection device (83), e.g. a circular disc, is provided at a distance after said outlet/s in order to deflect the air flow and to increase the velocity of in the first place the lighter parts of the bulk goods in this region of the drum.
- 15 8. A drum according to one of the Claims 1-7, c h a r a c t e r i s e d in that a second barrier (66B) is provided in the separation portion, and that this barrier in a similar manner like the barrier (66A) which delimits the entrance portion (6) of the drum from the separation portion (7) is surrounded on one side by means (10B) for feeding goods
20 along the wall of the drum towards said barrier (66B) and on the other side by means (18B, 19B) for feeding goods, which have passed the barrier, towards one or more additional outlets (12B) in the wall of the drum.
- 25 9. A drum according to one of the preceding Claims, c h a r a c t e r i s e d in that between the means (18A, 19A, 18B, 19B, 85) which are provided to feed goods, which have passed the respective barrier, in the direction towards the respective outlet (12A, 12B, 83A, 83B), there are
30 provided means (20A, 21A, 20B, 21B, 86) for lifting up the bulk goods at the rotation of the drum such that the lighter components of the bulk goods, when they fall down again, are caught by the stream of air and driven towards the discharge opening in the far end of the drum.

Fig. 1.

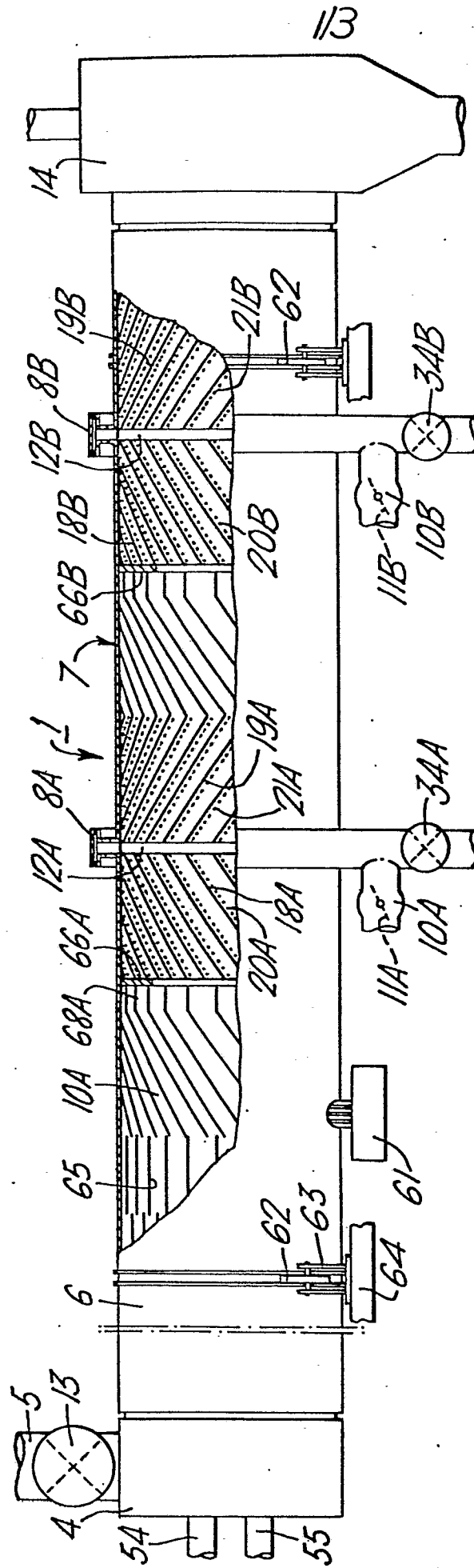
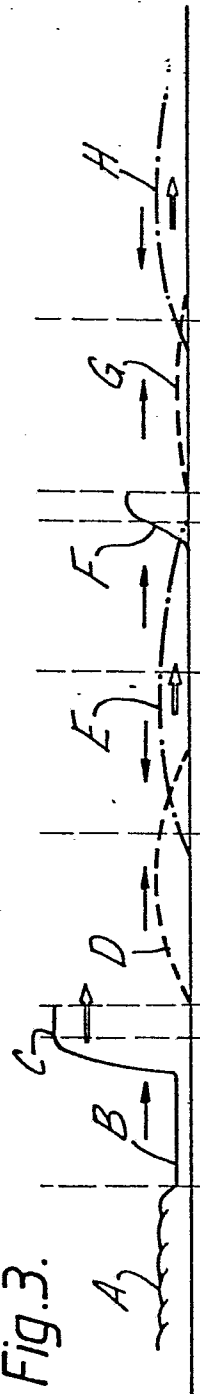


Fig. 3.



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Fig. 2.

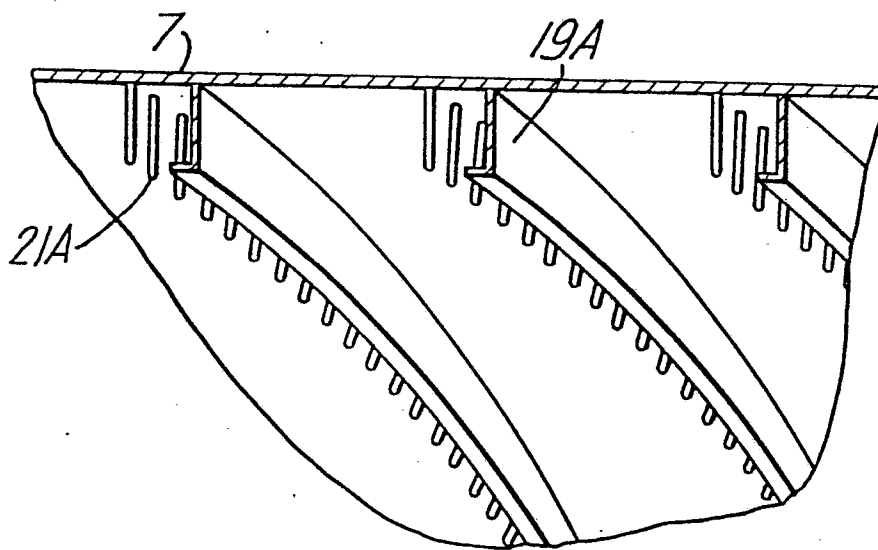


Fig. 4.

