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(54) Title: CONDENSER DEVELOPED AT THE OUTLET OF THE FLAKE ROLLER

(57) Abstract: Invention relates to condenser developed at the outlet of the flake roller in order to remove both the steam and moisture resulting from the cooking process before the flake roller and the water released from the grain during the crushing process in the flake roller from the flow before the dryer, after the grains such as corn, wheat, oat, barley cooked in the steam tower with high pressure superheated steam before entering the flake roller and turned into flake in roller after being fed into flake roller in flake feed production process, which is becoming increasingly widespread in the field of fattening feed production. In developed flake roller outlet condenser, there is a condenser block positioned at lower part of the surface to keep the condensation surface cold so that there is a continuous condensation.

CONDENSER DEVELOPED AT THE OUTLET OF THE FLAKE ROLLER

TECHNICAL FIELD

Invention relates to the condenser developed at the outlet of the flake roller in order to remove both the steam and moisture resulting from the cooking process before the flake roller and the water released from the grain during the crushing process in the flake roller from the flow before the dryer, after the grains such as corn, wheat, oat, barley cooked in the steam tower with high pressure superheated steam before entering the flake roller and turned into flake in the roller after being fed into the flake roller in the flake feed production process, which is becoming increasingly widespread in the field of fattening feed production.

PRIOR ART

The importance of flake feed production is gradually increasing in the feed sector in order to obtain high efficiency feed in fattening feed production. The flake feed product is obtained by drying the remaining steam and moisture after the grains such as corn, barley, wheat, oats are crushed in flake (leaf) form by means of the flake roller mill after the cooking process with superheated steam.

It is also proven by scientific studies that the digestion of starch and similar ingredients in the content of grains increases after the formation of flake, and thus important elements for stock-breeding such as live weight and milk yield of livestock increase at high rates and stock-breeding productivity increases.

In flake feed production, the grains cooked with high pressure steam in the steam tower before the flake roller mill are flaked by means of the crushing cylinders in the flake roller mill, and then flake fattening feed is obtained by enabling that this grain flow in the form of flake is transferred to the dryer and the moisture and water contained in it are separated from the product. However,

in flake feed processes, there is a high energy consumption for the drying process due to both the steam and moisture remaining from the steam cooking process and the water released from the grains crushed in the flake roller mill.

In the systems used for flake feed production in the current technique, the grain cooked with superheated steam in the steam boiler is transferred directly to the dryer after being crushed in the flake roller mill. As mentioned in the **Document No.TR200908671**, the crushed grain coming out of the flake roller mill is passed through the dryer in order to separate the excess moisture and water from the product and then the feed product is obtained. There is no improvement here to separate the steam, moisture or water contained in the grain from the grain flow at the flake roller mill outlet.

In the document **No.TR201703707**, the flaked grain in the flake roller mill after being subjected to superheated steam cooking in the steam tower, comes out directly from the roller mill and transferred to the dryer. Again, there is no improvement in the separation of steam, moisture and water in the crushed grain at the flake roller mill outlet.

BRIEF DESCRIPTION OF THE INVENTION

Flake roller outlet condenser, which is the subject of the invention, is developed to remove steam, moisture and water remaining in the grain flow at the flake roller outlet before the dryer, after the grains such as corn, barley, oats, wheat are crushed in the flake roller, where they are being transferred after the application of superheated steam cooking process in the steam tower in the flake fattening feed production.

In the grain, which is crushed and flaked in the flake roller, there are both steam and moisture remaining from the steam tower where superheated steam cooking is applied before the flake roller, and the water content released from the grain during the crushing in the roller. This steam, moisture and water contained in the flaked grain causes high energy consumption during the drying process. In the flake roller outlet condenser developed for this reason, a condensation surface (3.1) is formed on the flake outlet body (3), so as to allow

the grain that is crushed between the flake roller cylinders (2) to exit from the flake roller after it hits this surface (3.1).

In the developed flake roller outlet condenser, there is a condenser block (4) on the condensation surface (3.1), positioned underneath the surface (3.1) so as to keep it cold to ensure a continuous condensation.

In the developed flake roller outlet condenser, the water condensed on the condenser surface (3.1), on which the condensation takes place by staying cold thanks to the condenser block (4), is transferred from the water retention drain (3.3) to the discharge channel (3.4) and discharged from the flake roller. Then, the flaked grain flow, in which steam, moisture and water are removed, is taken out of the flake roller to be transferred to the dryer through the flake outlet (3.2).

Thanks to the developed flake roller outlet condenser, most of the steam, moisture and water in the flaked grain flow are removed, thus reducing the amount of energy required during drying and reducing energy consumption considerably.

MEANING OF THE FIGURES

Figure 1. Flake Roller Sectional View

Figure 2. Flake Roller Exploded View

Figure 3. Flake Roller Outlet Condenser Detail Sectional View

Figure 4. Detail Sectional View of the Flake Roller Outlet Condenser with Cooling Openings

The part numbers given in the figures are provided below.

1. Flake Roller Chassis
2. Flake Roller Cylinder
3. Flake Outlet Body
    - 3.1. Condensation Surface
    - 3.2. Flake Outlet Nozzle

3.3. Water retention drain

3.4. Discharge Channel

4. Condenser Block

4.1. Cooling Channel

DETAILED DESCRIPTION OF THE INVENTION

In the process of flake feed production, the flake roller outlet condenser, which is the subject of the invention, developed with the intention of removing the steam, moisture and water remaining in the grain flow after the grains such as corn, barley, oat, wheat being cooked in the steam tower with superheated steam and crushed in the flake roller, which they are transferred into, at the flake roller outlet before being transferred into the dryer; contains the condenser block (4) parts and sections, onto which grains flaked by crushing between the flake roller cylinders located on the flake roller chassis (1) being transferred, and which contains at least one condensation surface (3.1), at least one flake outlet (3.2), at least one water retention drain (3.3) and at least one flake outlet body (3) containing at least one discharge channel (3.4) and at least one cooling channel (4.1) that can be developed depending on the design.

The flake outlet body (3) developed in the flake roller outlet condenser, which is the subject of the invention, is the part positioned preferably at the bottom of the flake roller cylinders (2) so as to contain at least one condensation surface (3.1), at least one flake outlet (3.2), at least one water retention drain (3.3) and at least one discharge channel (3.4). It is the section where the crushed grains are transferred on to, which are fed to the flake roller and flaked by crushing by means of the flake roller cylinders (2) after being subjected to cooking with superheated steam in the steam tower.

The condensation surface (3.1) developed in the flake roller outlet condenser, which is the subject of the invention, is the section formed on the flake outlet body (3) in such as way that the grains crushed between the flake roller cylinders (2) to fall on it after leaving the rollers (2) with the effect of gravity and preferably in a way not to prevent the flow, and in an inclined structure so as to increase the condensation surface area coming into contact

with the grain. The condensation surface (3.1) is the section positioned on the flake outlet body (3) in such a way that it comes into contact with the condenser block (4) that creates the temperature difference to ensure condensation.

The flake outlet (3.2) developed in the flake roller outlet condenser, which is the subject of the invention, is the section where the grain flow, a substantial part of the steam, moisture and water in it being removed after contacting with the condensation surface (3.1), pass through and transferred outside of the flake roller.

The water retention drain (3.3) developed in the flake roller outlet condenser, which is the subject of the invention, is the section formed preferably at the lower part of the condensation surface in a way to enable to remove the steam, moisture and water from the grain flow, by force of gravity, passing between the flake roller cylinders (2), accumulated in the form of liquid water, resulting from both by the steam, moisture remaining after the cooking process with superheated steam in the steam tower and the water released from the grain during crushing process, on the condensation surface (3.1) by the effect of surface tension.

The discharge channel (3.4) developed in the flake roller outlet condenser, which is the subject of the invention, is the section that directs the water in a way that the water accumulated on the condensation surface (3.1) and separated from the grain flow with the water retention drain (3.3) is transferred outside the flake roller. In this way, a substantial part of the steam, moisture, water and the free steam in the environment resulting from the superheated steam cooking in the steam tower and crushing of the grain are removed from the flaked grain, thus enabling the drying process to be performed with lower energy consumption.

The condenser block (4) developed in the flake roller outlet condenser, which is the subject of the invention, is the part that is positioned at the lower part of the condensation surface (3.1) in a way to come into contact with the condensation surface (3.1). The condenser block (4) is a part made of composite concrete preferably containing polymer additives and preferably basalt in order to make the heat transfer difficult and to create a continuous

temperature difference with the grain flow hitting the condensation surface (3.1) and the free steam in the environment. Thus, continuous and intense condensation is ensured by always achieving lower temperature than grain flow on the condensation surface (3.1) that is in contact with the condenser block (4). In this case, a substantial part of the steam, moisture and water in the grain flow are removed from the flow. The condenser block (4) is the part that preferably includes at least one cooling channel (4.1) so as to reduce the temperature of the block (4) with air flow, coolant or cooling water for use in areas where ambient temperature is high.

CLAIMS

1. It is a roll outlet condenser, which is the subject of the invention, developed to remove the steam, moisture and water remaining in the grain flow after crushing grains such as corn, barley, oats, wheat in the flake roller after being cooked with superheated steam in the steam tower, at the flake roller outlet before dryer, and it is characterized by containing at least one condensation surface (3.1) on which the grains flaked between the flake roller cylinders (2) located on the flake roller chassis (1) are transferred onto, at least one flake outlet (3.2), at least one water retention drain (3.3) and at least one flake outlet body (3) containing discharge channel (3.4) and condenser block (4) parts and sections containing at least one cooling channel (4.1) that can be developed depending on the design choice.

2. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said flake outlet body (3).being the part preferably positioned at the bottom of flake roller cylinders (2) so as to contain at least one condensation surface (3.1), at least one flake outlet (3.2), at least one water retention drain (3.3) and at least one discharge channel (3.4).

3. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said flake outlet body (3) being the section, on which grains flaked by means of flake roller cylinders (2) transferred onto after being subjected to cooking process with superheated steam in the steam tower.

4. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said condensation surface (3.1) being the section formed on the flake outlet body (3) in such a way that the grains crushed between the flake roller cylinders (2) to fall on it after leaving the rollers (2) with the effect of gravity and preferably in a way not to prevent the flow, and in an inclined structure so as to

increase the condensation surface area coming into contact with the grain.

5. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said condensation surface (3.1) being the section positioned on the flake outlet body (3) in such a way that it comes into contact with the condenser block (4) that creates the temperature difference to ensure condensation.

6. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said flake outlet (3.2) being the section where the grain, a substantial part of the steam, moisture and water in it being removed after contacting with the condensation surface (3.1), pass through and transferred outside of the flake roller.

7. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said water retention drain (3.3) being the section formed preferably at the lower part of the condensation surface in a way to enable to remove the steam, moisture and water from the grain flow, by force of gravity, passing between the flake roller cylinders (2), accumulated in the form of liquid water, resulting from both by the steam, moisture remaining after the cooking process with superheated steam in the steam tower and the water released from the grain during crushing process, on the condensation surface (3.1) by the effect of surface tension.

8. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said discharge channel (3.4) being the section that directs the water in a way that the water accumulated on the condensation surface (3.1) and separated from the grain flow with the water retention drain (3.3) is transferred outside the flake roller.

9. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said condenser block (4) being the part that is positioned at the lower part of the condensation surface (3.1) in a way to come into contact with the condensation surface (3.1).

10. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said condenser block (4) being the part made of composite concrete preferably containing polymer additives and preferably basalt in order to make the heat transfer difficult and to create a continuous temperature difference with the grain flow hitting the condensation surface (3.1) and the free steam in the environment.

11. It is a flake roll outlet condenser as per claim 1, and it is characterized by the said condenser block (4) being the part that preferably includes at least one cooling channel (4.1) so as to reduce the temperature of the block (4) with air flow, coolant or cooling water for use in areas where ambient temperature is high.

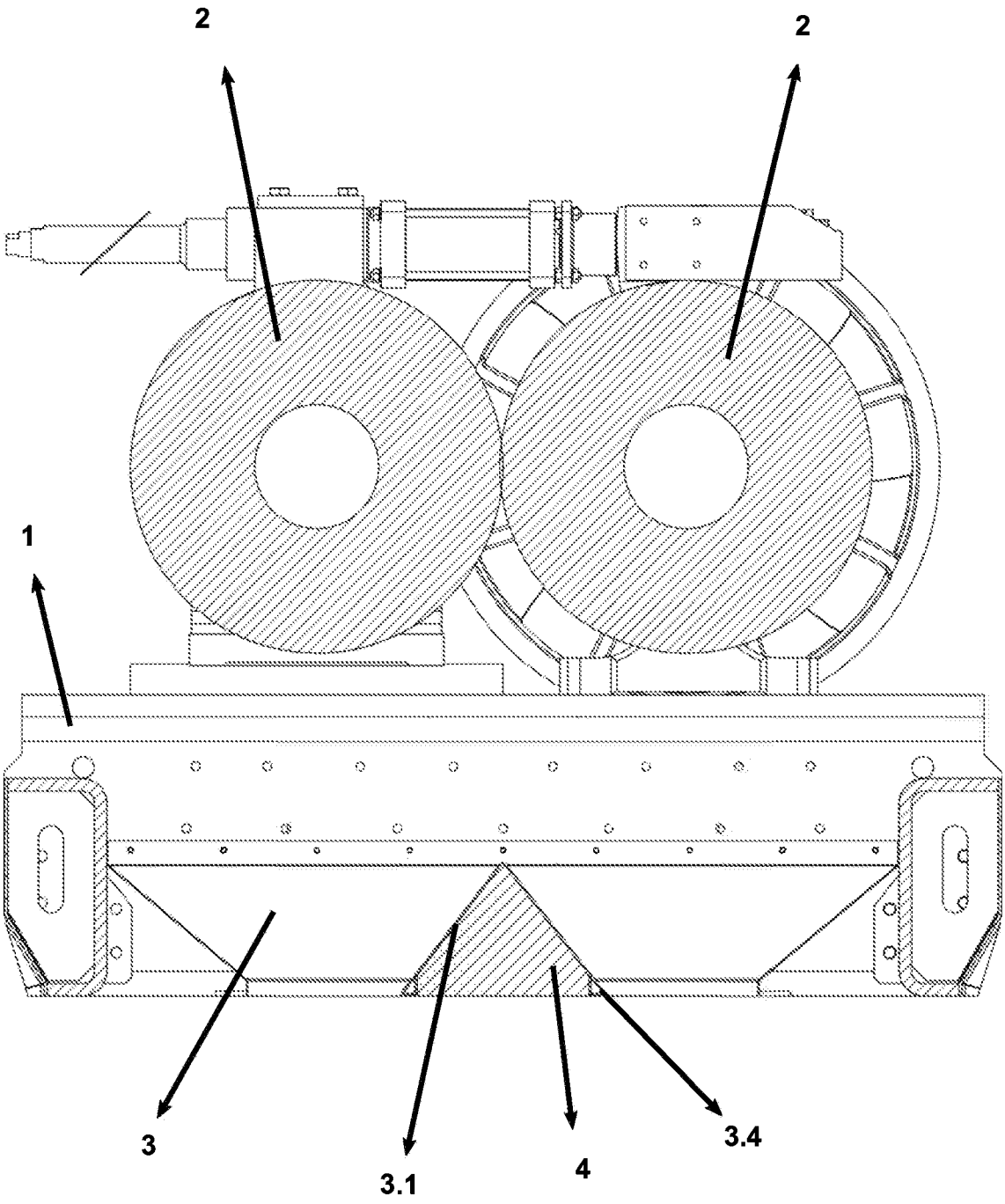

FIG. 1

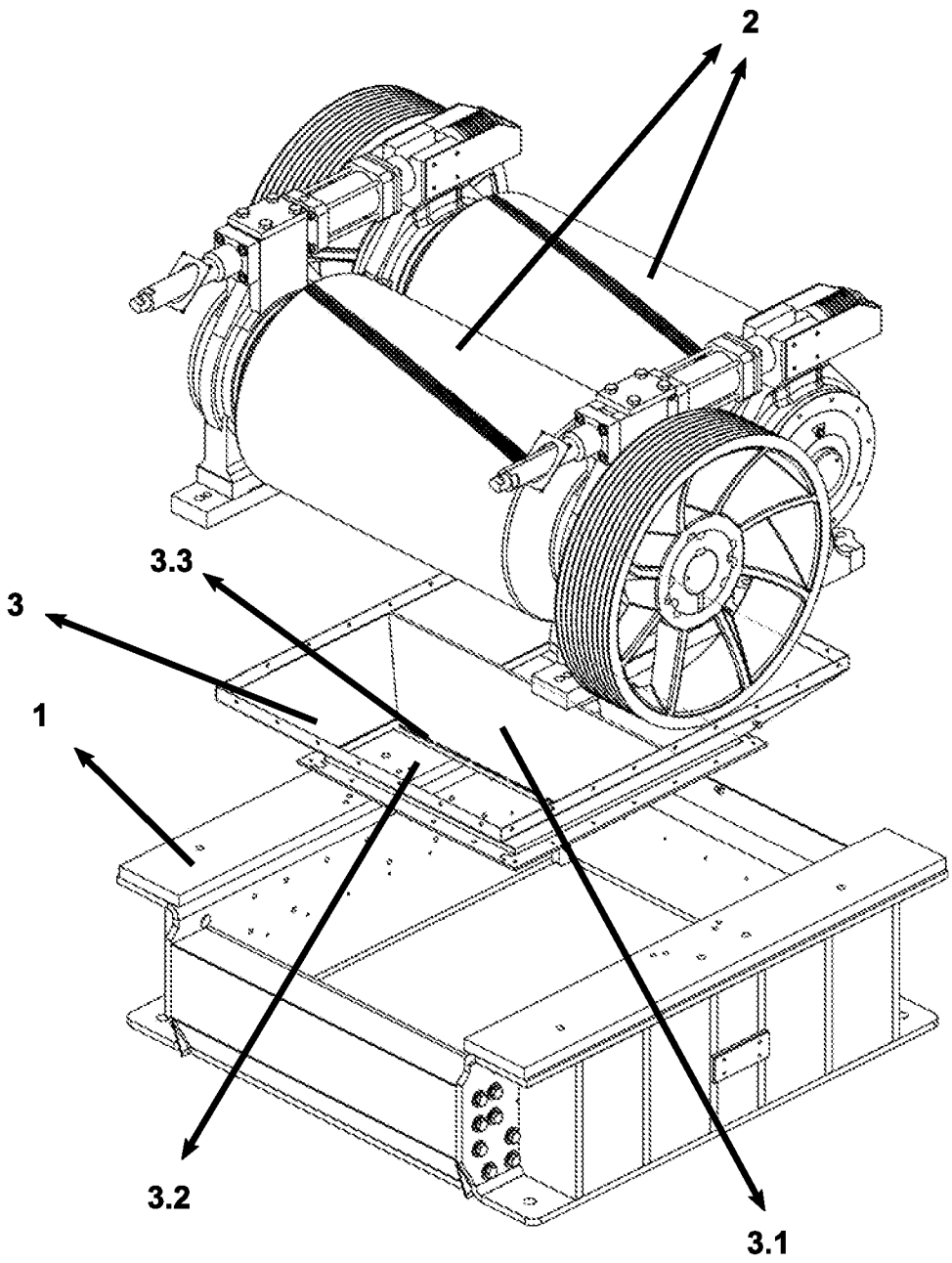

FIG. 2

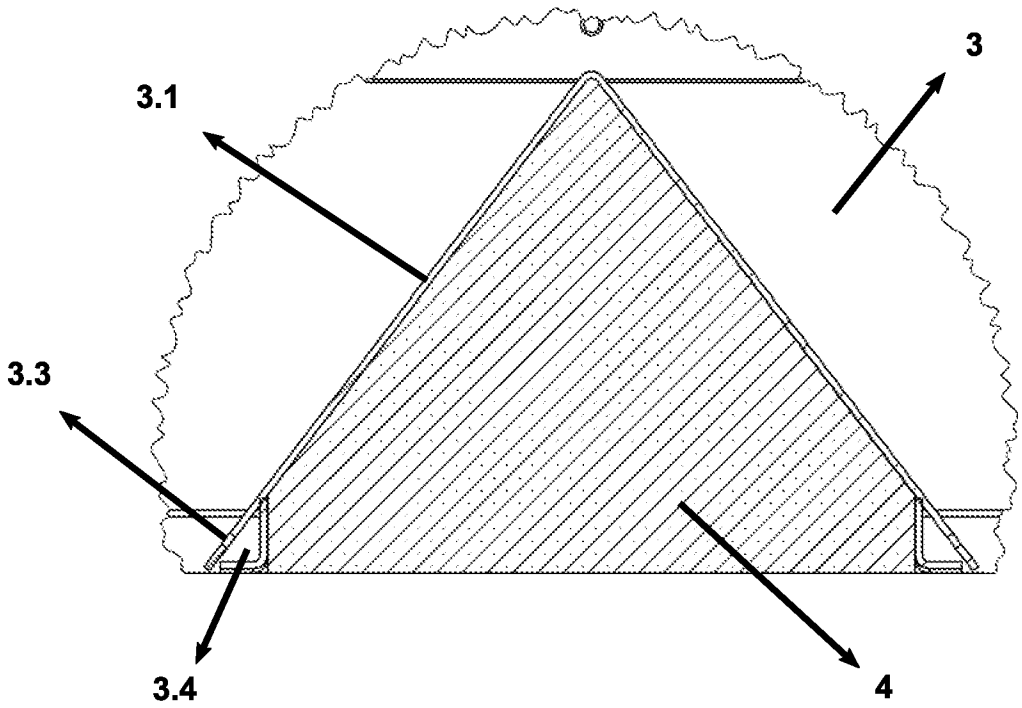

FIG. 3

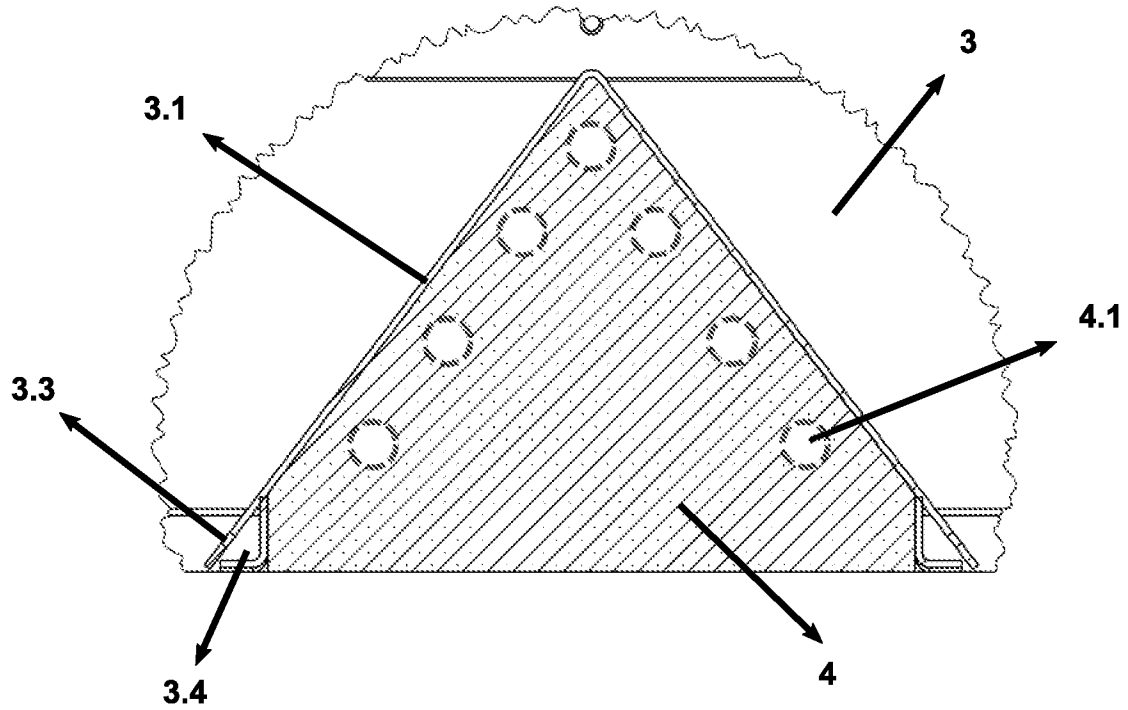

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/TR2021/050138

A. CLASSIFICATION OF SUBJECT MATTER

A23N 17/00 (2006.01)i; A23K 40/00 (2016.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A23N 17/00; A23K 40/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5598770 A (CACTUS FEEDERS INC [US]) 04 February 1997 (1997-02-04) All document	1-11
A	EP 1396197 A1 (MATERIAL GANADERO CANAR S L [ES]) 10 March 2004 (2004-03-10) All document	1-11
A	CN 107300302 A (HEFEI ZHAOXIA MACHINERY TECH CO LTD) 27 October 2017 (2017-10-27) All document	1-11

☐ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/TR2021/050138

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
US	5598770	A	04 February 1997	NONE			
EP	1396197	A1	10 March 2004	ES	2178973	A1	01 January 2003
				ES	2178973	B1	16 April 2004
				WO	02100195	A1	19 December 2002
CN	107300302	A	27 October 2017	NONE			