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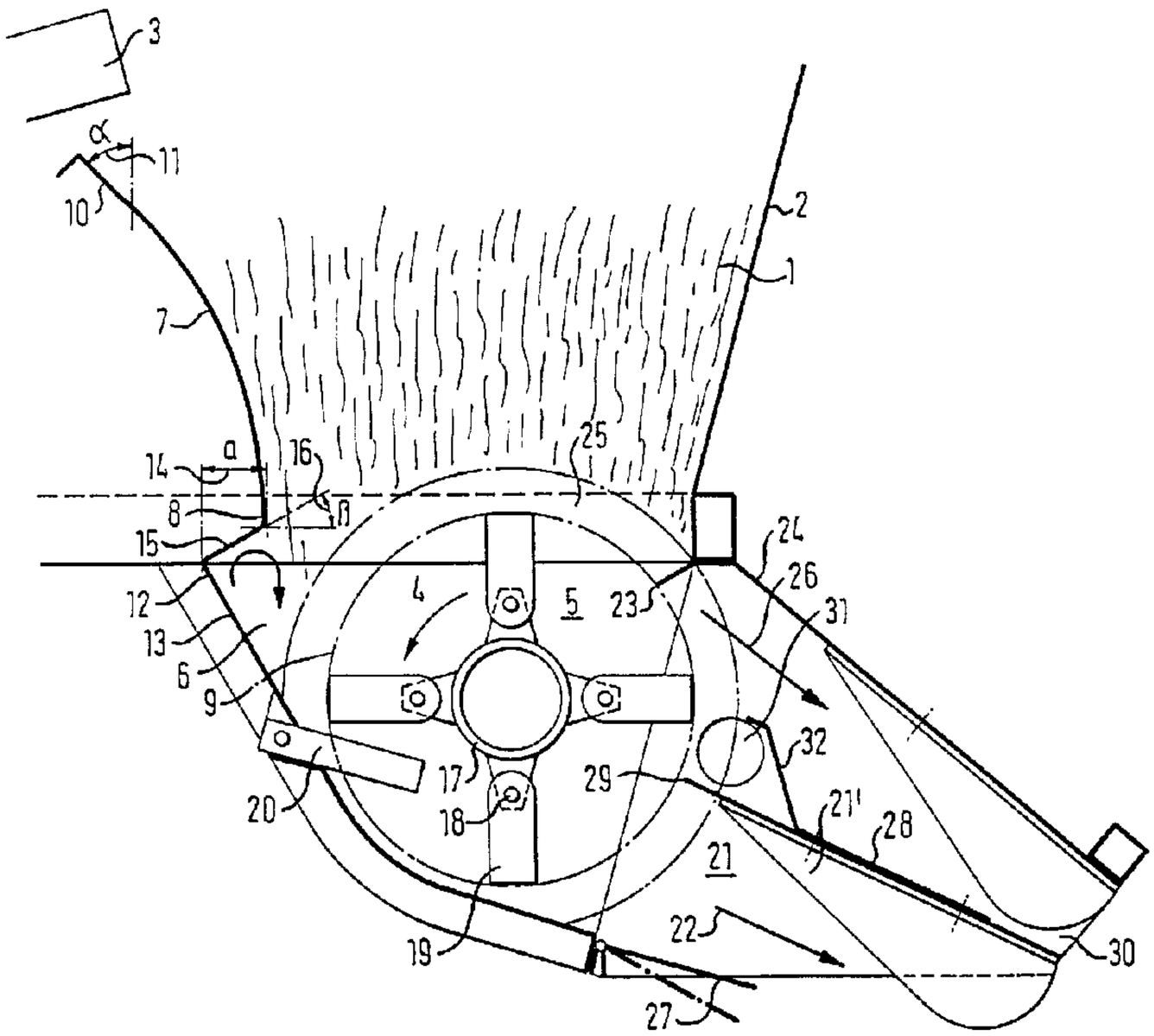
(54) Titre : SYSTEME A HACHER LA PAILLE POUR BROYER DE LA PAILLE DERRIERE LES DISPOSITIFS DE SEPARATION DU GRAIN D'UNE MOISSONNEUSE-BATTEUSE COMBINEE

(54) Title: CHAFF CUTTER FOR COMMINUTING HAULM BEHIND THE GRAIN-SEPARATOR DEVICES OF A COMBINE HARVESTER



(57) Abrégé/Abstract:
The subject matter of the invention is a straw-cutting machine which is disposed behind the grain separating devices of a combine harvester and whose separating means cut up the stalks falling down from the straw walkers into short pieces. In this process, thanks to an innovative, special disposition of the generally conventional deflector which, under the straw walkers, deflects the stalks falling down from these to the cutter tray at the inlet into the cutter, the receiving of the stalks by the cutting drum is made more secure and, on the other hand, thanks to an innovative, special design of the distribution hood following the cutter, the ejection and the distribution of the chopped up stalks over the field soil is essentially improved over existing designs.

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Abstract

The subject matter of the invention is a straw-cutting machine which is disposed behind the grain separating devices of a combine harvester and whose separating means cut up the stalks falling down from the straw walkers into short pieces. In this process, thanks to an innovative, special disposition of the generally conventional deflector which, under the straw walkers, deflects the stalks falling down from these to the cutter tray at the inlet into the cutter, the receiving of the stalks by the cutting drum is made more secure and, on the other hand, thanks to an innovative, special design of the distribution hood following the cutter, the ejection and the distribution of the chopped up stalks over the field soil is essentially improved over existing designs.

The subject matter of the invention is a straw-cutting machine which is positioned behind the grain separating devices of a combine harvester and whose separating organs chop the stalks falling from the straw walkers into short pieces.

The object of the present invention can be found in that, on the one hand, thanks to an innovative, special disposition of the generally conventional deflector, which – below the straw walkers – guides the stalks falling down from these to the cutting tray at the inlet into the cutter and, on the other hand, thanks to an innovative, special design of the distributor hood located behind the cutter, the receiving of the stalks by the chopping drum is more secure and the ejection and distribution of the chopped stalks onto the field soil is essentially improved over existing designs.

A secure, uninterrupted receiving of the straw by the chopping drum prevents interruptions to and jams in the straw outlet hood of the combine harvester due to the stalks falling from the straw walkers and has a positive effect on the chopping process.

A uniform distribution of the chopped stalks over the whole cutting width through the distribution hood is desirable for an uninterrupted working into the field soil and the best possible rotting.

Due to the relatively high speed of the chopping drum, there is formed around the chopping drum of a combine harvester straw-cutting machine a mantle-like rotating ring of air of which, in cutters of current design, a substantial portion flows into the straw outlet hood and hinders the receiving of the stalks falling from the straw walkers by cutting blades or tangs.

This air which has flowed into the straw hood is then not available for the ejection of the chopped stalks.

In accordance with the invention, this hindrance is avoided by the deflector at the inlet into the chopping housing being formed in an arched design between the end of the straw walker and the inlet into the cutter, with the upper part of the deflector possessing a certain angle to the perpendicular, while the lower part ends approximately perpendicularly. Furthermore, the inlet of the cutting tray is inset forwards from the centre of the cutter over the lower part of the deflector.

The lower end of the deflector and the beginning of the cutting tray are connected to each other by an approximately horizontal transverse tray. Advantageously, this transverse tray is designed with an upwards arch form. Thanks to this combination of deflector end to cutting tray inlet, the ring of air around the outer effective diameter of the cutting drum is cut off which thus prevents air flowing into the straw ejector hood and thus hindering the receiving of the stalks to be chopped. Rather, the cut off air is deflected into the area of rotation of the chopping drum, by means of which at the inlet into the chopping box a slight suction effect is created on the stalks to be chopped in the direction of rotation of the chopping drum.

At the transition of the chopping box to the distribution hood, a similarly negative effect of the ring of air exists in cutters of current construction.

The height of the inlet to the distribution hood on cutters of current construction is a maximum of 1/3 of the drum diameter.

Following on this is a closed part up to the connection of the cutter to the straw ejector hood of the combine harvester. In this part, a ring of air builds up which flows into the straw ejector hood and which pushes upwards the stalks falling from the straw walkers.

In accordance with the invention, the transition from the cutter housing to the straw ejector hood is designed so that the free exit height is around 2/3 of the drum diameter, with the upper cover of the distribution hood possessing at the front end transversely over the width a tray which is aligned approximately perpendicularly to the central axis of the cutting drum and having a distance to the outer drum circumference of around 10 mm. In this way, the ring of air is cut off and deflected into the distribution hood. To avoid eddies of air in the distribution hood, roughly at the centre of the height of the distribution hood, a transverse metal partition is installed which divides the distribution hood into two chambers and whose front edge also extends perpendicularly to the central axis of the cutting drum up to about 10 mm away from the outer circumference of the cutting drum, with as a result the ring of air also being cut off here and the air being deflected into the distribution box.

Directly above the metal partition, at the transition from the cutter housing to the distribution hood, apertures are disposed on both side walls of the distribution hood through which the air can flow in. A transverse intermediate plate separates the air flowing in from the area above the metal partition.

Thanks to the actions at the cutter inlet and the cutter outlet described above, it is prevented that at these points air flowing off the ring of air presses into the straw ejector hood.

The transverse distribution of the chopped stalks flowing out of the distribution hood is performed in the known manner by means of arched distribution plates rotatable through a roughly perpendicular axis.

The vertical distribution of the stalks flowing out is performed by an adjustment to the metal partition and the floor plate around horizontal axes in the area of the connection of the distribution hood to the cutter housing.

In accordance with a first aspect of the present invention, there is provided a straw-cutting machine for chopping stalks behind grain separating devices of a combine harvester having a straw walker end with straw walkers and a straw outlet, the straw-cutting machine comprising

(i) a deflector having a front wall facing the grain separating devices and an opposing rear wall, and defining an enclosed straw path having a decreasing cross-sectional area between an inlet end and an outlet end; and

(ii) a cutter housing at least partly enclosing a cutting drum rotatable about a drum axis and having an inlet end comprising a cutter tray and having an outer effective diameter wherein

(a) the front wall comprises an arched upper portion located beneath the straw walkers and inclined forwards at an angle of at least 25 degrees to a first vertical plane through the wall below a rearmost portion of the straw walkers;

(b) the rear wall is connected at the outlet end to the cutter tray at a point rearwards of a second vertical plane through the drum axis; and

(c) the cutter tray protrudes forwards beyond the outlet end of the deflector by a distance "a" which is greater than 30mm.

The design of the straw-cutting machine in accordance with the invention is disclosed in Fig. 1 and Fig. 2 with the associated descriptions.

In these:

Fig. 1 shows a straw-cutting machine in which the cutting blades are affixed in a freely movable manner to the drum jacket and work against rigid counter-blades affixed to the cutting tray;

Fig. 2 shows a straw-cutting machine in which rigid tangs are affixed to the drum jacket which work together with cutting blades affixed to the cutting tray.

With reference to Fig. 1:

The stalks (1) to be chopped fall inside the straw ejector hood (2) from the ends of the straw walkers (3) onto the cutting drum (5) rotating in the direction of the arrow (4).

Here, between the ends of the straw walkers (3) and the inlet gap (6), the stalks falling down from the straw walkers is restricted in a forward aspect by an arch-shaped

deflector (7). The lower end (8) of the deflector (7) runs roughly perpendicularly towards the outer region of the outer effective diameter (9) of the cutting drum (5).

The upper end (10) of the deflector (7) below the straw walkers can be inclined up to an angle α(11) = 45 degrees to the perpendicular.

The upper end (12) of the cutter tray (13) is transposed over the lower end (8) of the deflector (7) by a distance "a" (14) by at least 20 mm to the front in the direction shown.

The lower end (8) of the deflector (7) is connected to the upper end (12) of the cutter tray (13) by a transverse plate (15) which is designed in accordance with Fig. 1 as a straight sheet which is installed in a position from the horizontal to an angle of ß (16) less than 60 degrees and preferably less than 45 degrees.

On the cutting drum (5), any number of cutting blades (19) are affixed freely movable around a point of rotation (18) on the jacket plate (17).

These receive the stalks falling down and chop them up while they pass through the counter-blades (20) affixed to the cutter tray (13).

The chopped up stalks are carried out of the cutter drum (5) through the distribution hood (21, 21') in the direction of the arrow (22).

Following on from the cutter drum (5), from the outlet at the bottom up to the connection to the straw ejector hood (2), the distribution hood (21, 21') is open at the top, at least in a region which corresponds to 2/3 of the outer effective diameter (9) of the drum. The front edge (23) of the top cover plate (24) is designed so that it extends roughly perpendicularly to the cutting drum (5) centre to around a distance of 10 mm to the outer effective diameter (9) of the cutting drum (5).

In this way, a ring of air (25) forming around the cutting drum is cut off and deflected in the direction of the arrow (26).

To optimise the flow relationships in the distribution hood, an intermediate plate (28) is fixed roughly in the centre between the upper cover plate (24) and the bottom outlet plate (27) transversely through the distribution hood; said intermediate plate (28) extends with its front edge (29) to around 5 mm from the outer effective diameter (9) of the cutting drum (5) and thus also cuts off the ring of air (25) here and deflects the air in the direction of the arrow (22).

To ensure that a ring of air being built up does not get the air from the outlet (30) of the distribution hood and so interrupts the air flowing out in the direction of the arrow (26), in the side walls of the distribution hood apertures (31) are made which are covered with respect to the inside space (21') by a cover plate (32) running transversely through the distribution box.

With reference to Fig. 2:

Fig. 2 corresponds exactly to Fig. 1 with the exception of the two modifications given below. Instead of the transverse plate (15), a transverse plate (34) arched upwards is used. The freely movable cutting blades (19) are replaced by rigid tangs (35).

We Claim:

1. A straw-cutting machine for chopping stalks behind grain separating devices of a combine harvester having a straw walker end with straw walkers and a straw outlet, the straw-cutting machine comprising

(i) a deflector having a front wall facing the grain separating devices and an opposing rear wall, and defining an enclosed straw path having a decreasing cross-sectional area between an inlet end and an outlet end; and

(ii) a cutter housing at least partly enclosing a cutting drum rotatable about a drum axis and having an inlet end comprising a cutter tray and having an outer effective diameter

wherein

(a) the front wall comprises an arched upper portion located beneath the straw walkers and inclined forwards at an angle of at least 25 degrees to a first vertical plane through the wall below a rearmost portion of the straw walkers;

(b) the rear wall is connected at the outlet end to the cutter tray at a point rearwards of a second vertical plane through the drum axis; and

(c) the cutter tray protrudes forwards beyond the outlet end of the deflector by a distance "a" which is greater than 30mm.

2. A straw-cutting machine in accordance with Claim 1, wherein the outlet end of the straw deflector is connected to the cutter tray by a connecting plate.

3. A straw-cutting machine in accordance with Claim 2, wherein the connecting plate is substantially planar and has an angle of inclination less than 60 degrees to horizontal.

4. A straw-cutting machine in accordance with Claim 3, wherein the angle of inclination is less than 45 degrees to horizontal.

5. A straw-cutting machine in accordance with Claim 2, wherein the connecting plate is arched upwards.

6. A straw-cutting machine in accordance with Claim 1, wherein a distribution hood is provided downstream of the cutter housing.

7. A straw-cutting machine in accordance with Claim 6, wherein the distribution hood is coupled to the cutter housing and is constructed and arranged to provide a free aperture at a transition location having a cross-sectional dimension which is equal to at least 2/3 of the outer effective diameter of the cutting drum.

8. A straw-cutting machine in accordance with Claim 7, wherein the distribution hood has an upper cover plate which extends to at least 10 mm away from the outer effective diameter of the cutting drum and an end portion of the cover plate is substantially perpendicular to the drum axis.

9. A straw-cutting machine in accordance with Claim 6 or Claim 7, wherein the distribution hood is divided into an upper and a lower chamber by an intermediate plate having a front end which extends to at least 10 mm away from the outer effective diameter of the cutting drum and is substantially perpendicular to the drum axis and is swivellable around an axis roughly parallel to the drum center.

10. A straw-cutting machine in accordance with claim 9, constructed and arranged to cut off a ring of air forming around the cutting drum and to deflect the ring of air downstream into the distribution hood.

11. A straw-cutting machine in accordance with claim 9, wherein directly above the intermediate plate in side walls of the distribution hood, apertures are disposed which

are covered off from an interior space of the upper chamber by a metal partition disposed transversely through the distribution hood.

12. A straw-cutting machine in accordance with claim 6, wherein a lower wall of the distribution hood further comprises a floor plate constructed and arranged to be rotatable vertically around part of an axis of rotation proximate an outlet end of the cutter housing.

13. A straw-cutting machine in accordance with claim 1, constructed and arranged to cut off air around the effective outside diameter of the cutting drum and to deflecting this air into an area of rotation of the cutting drum to create a slight suction effect in a direction of rotation of the cutting drum on stalks to be chopped.

14. A straw cutting machine in accordance with claim 1, wherein the cutter tray further comprises counter-blades affixed thereto.

FIG.1

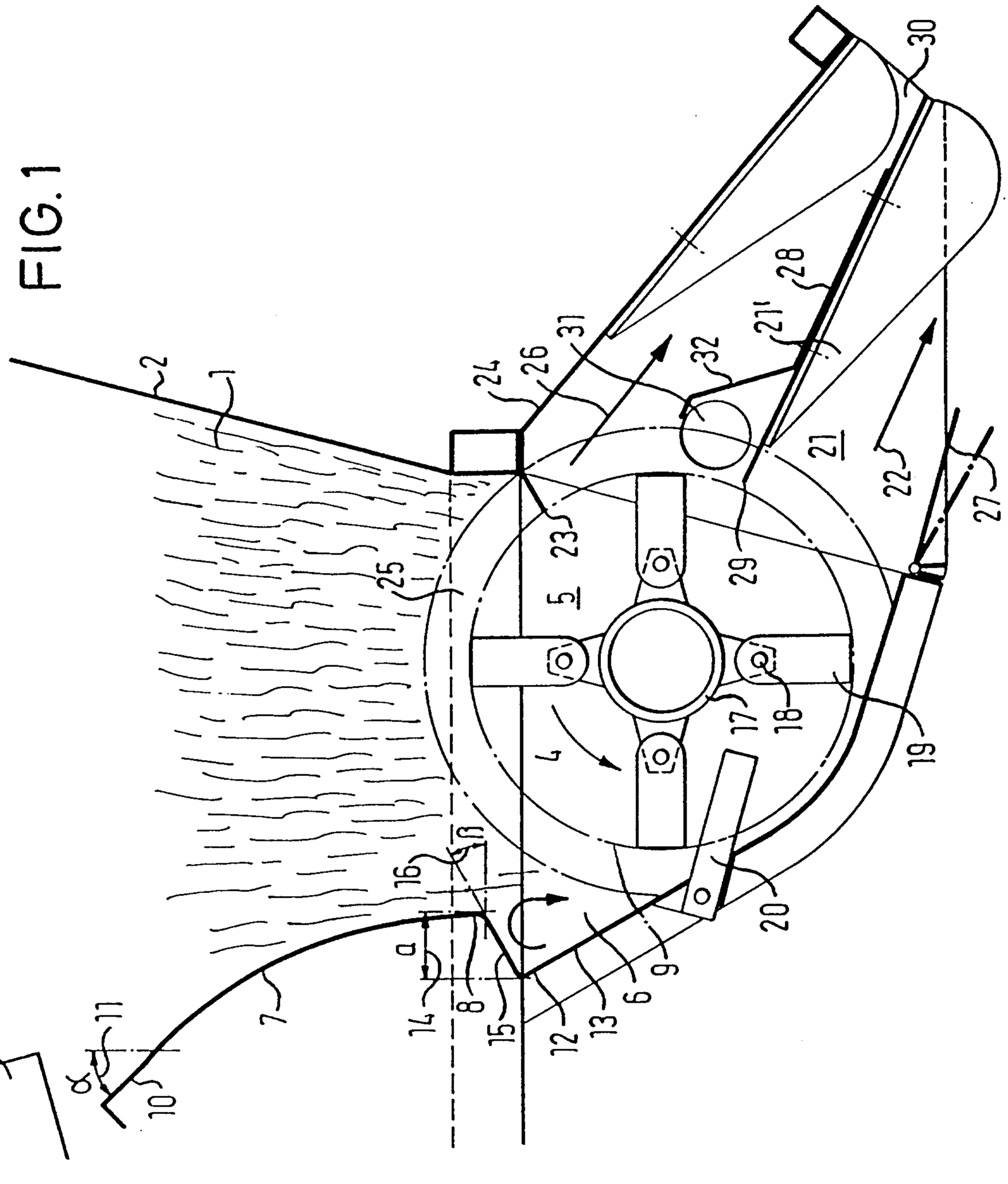
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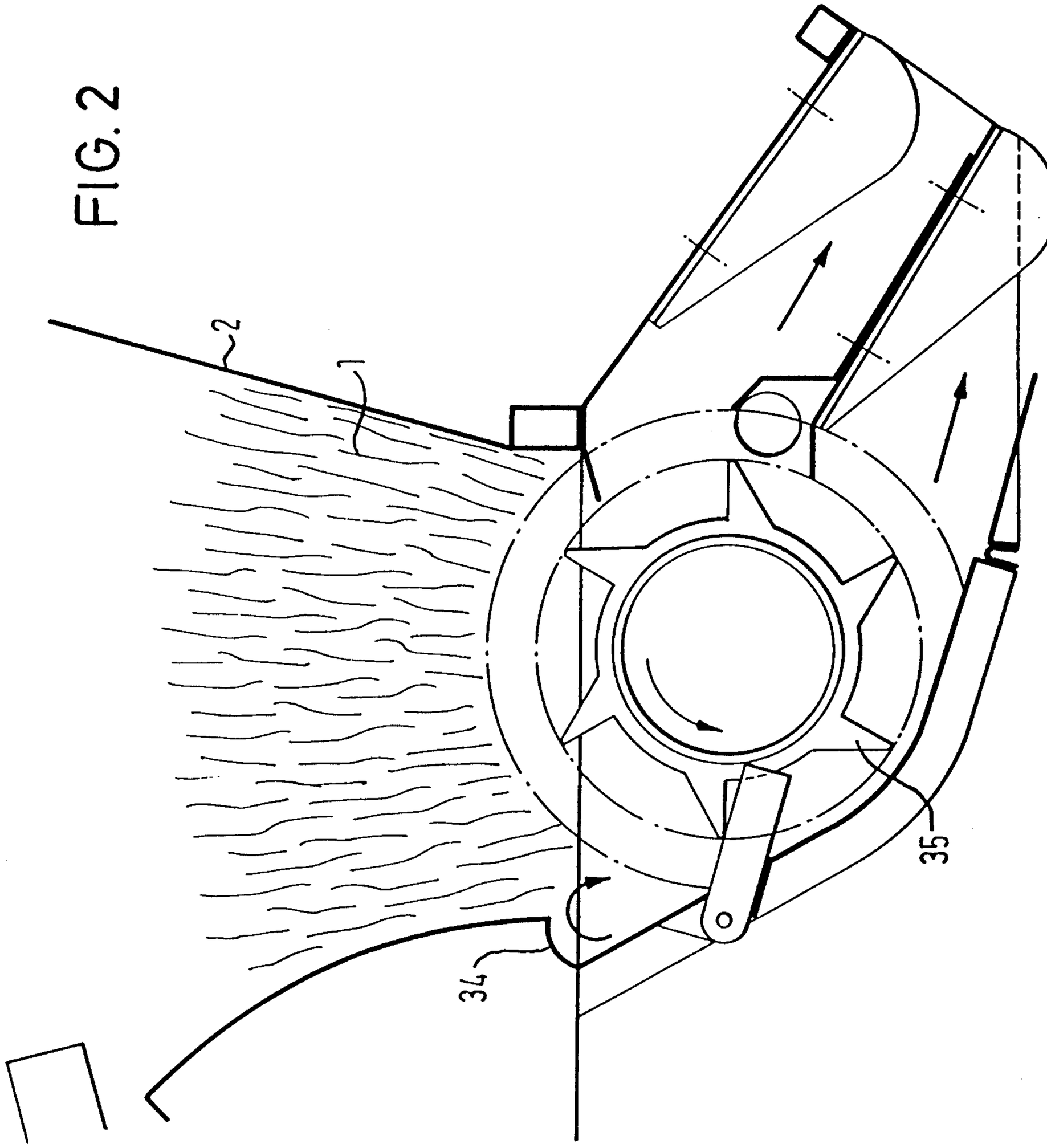
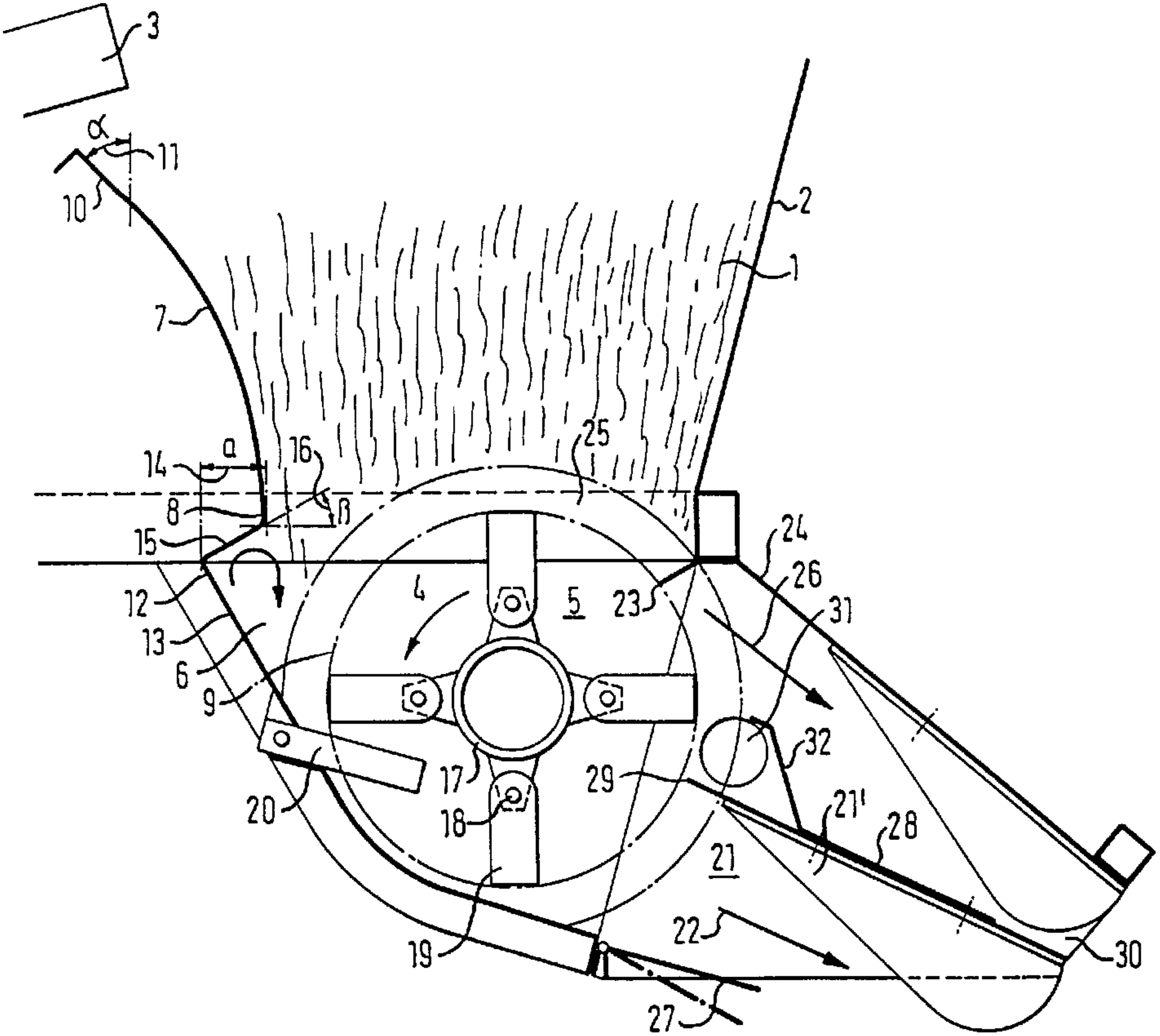
FIG. 2

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