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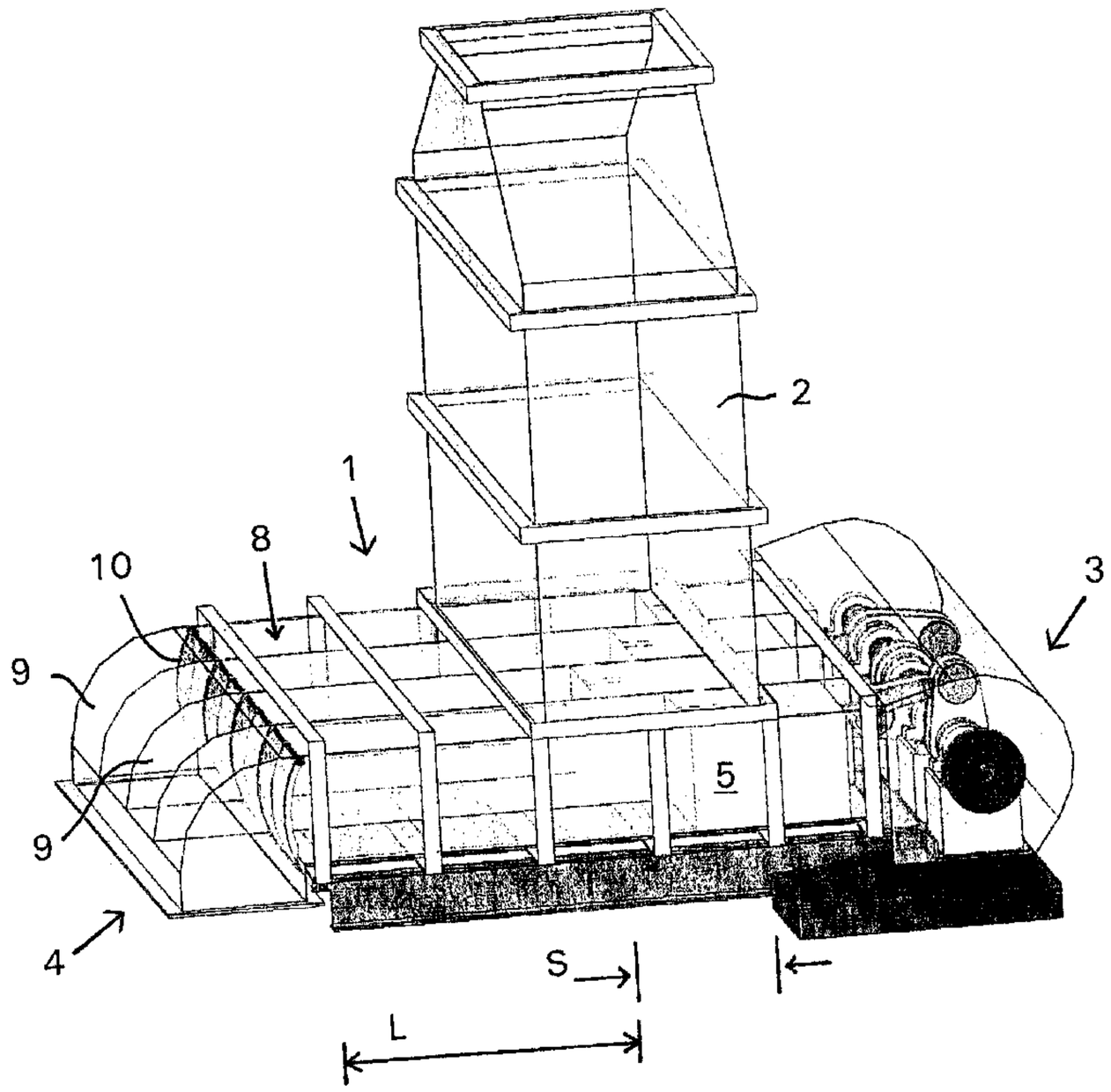
(54) Title: METHOD AND APPARATUS FOR FEEDING WOOD CHIPS INTO A CHIP BIN



(57) Abrégé/Abstract:
The invention concerns a method for feeding chips into a chip bin or corresponding, the chips in said method being forced to move substantially horizontally as a plug filling the cross-section of the transfer space. The chip plug is formed and maintained at a part of the length of the transfer space with chips forced batchwise to the transfer motion.

Abstract

The invention concerns a method for feeding chips into a chip bin or corresponding, the chips in said method being forced to move substantially horizontally as a plug filling the cross-section of the transfer space. The chip plug is formed and maintained at a part of the length of the transfer space with chips forced batchwise to the transfer motion.

Method and Apparatus for Feeding Wood Chips into a Chip Bin

The present invention concerns a method and a respective feeding apparatus for feeding chips into a chip bin. The object of the implementation of the method and the construction of the feeding apparatus is to prevent problems discovered with the methods of prior art and the feeding devices implementing the same. These problems include, among others, flow of gases from the bin upstream against the feeding direction of the chips in cases where the chips are treated in the bin with steam or process gases for heating the chips. Also dust formation of the chips when filling the bin has caused problems in the devices of prior art, because the dust also travels upstream against the direction of flow of the chips.

Problems have occurred when the feeding of the chips to the bin has been performed by means of a screw conveyor extending substantially to the feed opening of the bin. The screw conveyor operates characteristically so, that there is a lot of free space on the upper part of the conveyor, through which the gases and dust can be carried upstream against the feeding direction. The screw conveyor also loosens the conveyed chips in order to prevent the formation of a dense bed. For avoiding this problem, there has been suggested a stop baffle acting against gravity at the discharging end of the screw conveyor, meant to be closed after the chip flow stops. A chip feeding apparatus based on the described operation is disclosed i.a. in the U.S. Patent No 5,766,418. There have been, however, deficiencies discovered in the operation of the baffle, closing has not been reliable and discharging flows have occurred against the feeding direction in the functional situations. Another possibility of using a screw conveyor is to throttle the chip flow at the discharging end of the screw in order to form a chip plug, but this has been discovered to cause chip damages deteriorating the pulping and defibration to be performed afterwards.

Attempts to solve the dust and gas problems have also been made by using locker feeders as feeding devices of the chip bins. The problems with these devices is the wear caused by the chips and foreign agents coming with the chips, causing leakages, whereby the problems remain the same.

It has been discovered that the upstream flows against the feeding direction of the chips can be eliminated by means of a method in accordance with the present invention and a

feeding apparatus implementing the same. Further, the operation in accordance with the invention, as well as the implementing apparatus, do not cause problems for the chips to be fed.

When implementing the method in accordance with the invention, a plug moving substantially in the horizontal direction is formed of the chips to be fed, said plug filling the cross-sectional space of progress, preferably for a remarkable length of the space of progress. The chip plug is formed and maintained by means of chips forced to move batchwise, whereby the forcing period extends over a part of the length of the space of progress. This operation causes that the plug moves in the feeding direction only when new chips to be fed come to the pushing device to fill up the plug and push it forward for the length of the filling up in the feeding direction. When the incoming chip flow for some reason stops, the chip plug is immovable, as the filling up batches are missing. The chip plug formed in the space of progress acts, however, preventing the flow of the gases. The feeding situation continues when the chip flow returns to the feeding equipment.

The batches forming the chip plug in the space of progress can be formed as one batch having a cross section substantially corresponding to the cross sectional area of the space of progress. Alternatively, the feed batches can be formed as a plurality of batches distributed over the cross section of the transfer space and being moved to the feeding direction preferably at least partly nonsimultaneously. The above mentioned substantially horizontal travel of the plug must be in this connection interpreted rather freely, chiefly excluding the gravitational travel only. The path of travel can slightly differ from the horizontal direction, declining or inclining, taken into account, that there must be caused a certain resistance to motion for the plug for providing the required density of the plug. Naturally the length of the transfer space also has influence on the resistance to motion exerted to the plug.

The basic parts of the apparatus are the transfer channel and the inlet connection opening to one end thereof, and the outlet connection at the other end thereof, leading to the chip bin. Between these two connections the transfer channel has a certain length, that is at least in the same range as the diameters of the inlet connection and the outlet connection. For providing the transfer motion of the chips in the transfer channel from the inlet connection to the outlet connection, there are transfer elements of chips located in the

transfer channel. These transfer elements are according to the characterizing features of the invention, pushing means performing reciprocal movement in the direction of the transfer channel, located onto the opening area of the transfer channel, having a length of stroke substantially shorter than the transfer channel.

With these pushing means the chips falling from the inlet connection to the transfer channel are pushed forward in the feed direction of the channel, whereby the chips form a natural chip plug filling the cross-section of the channel and forms an obstacle against the gases and dust coming from the bin against the flowing direction.

The invention is described in more detail in the following, with reference to the enclosed drawing, wherein

Figure 1 shows a schematic drawing of the feeding apparatus in accordance with the invention, as a cutaway side view, and

Figure 2 shows a cutaway perspective view of the apparatus.

The apparatus shown in Figure 1 comprises a transfer channel 1 having preferably a rectangular cross-section and a length bigger than the height of the cross section. An inlet connection 2 of chips is connected to said channel, at one end thereof, on the upper side, where the chips to be fed are brought with conveyors known in the art, and spilled into the transfer channel. At the opposite end of the transfer channel 1 there is a discharge connection 4, through which the chips are spilled or discharged from the transfer channel 1 to be led to the chip bin, not shown in the drawing.

At the first end of the transfer channel, to the area, where the inlet connection 2 opens to the transfer channel 1, there are located chip transfer elements 3, comprised of a plurality of pushing means 5 performing reciprocal movement on the first end of the transfer channel. The total pushing surface of the pushing means 5 corresponds substantially to the cross-sectional area of the transfer channel. The pushing means are preferably acting alternately, whereby at least one of them is moving out of phase with the others, preferably so that at least one pushing means moves backwards while the others move in the feeding direction.

The operational motion of the pushing means can be achieved in a simple and reliable way by means of a crank mechanism 6 operated by a suitable drive equipment. Also a cylinder-piston mechanism, arranged for each pushing means separately or shared by a plurality of pushing means is usable as a drive system. The cylinder-piston mechanism can be pneumatic or hydraulic. A hydraulic and a pneumatic drive give more freedom for arranging the mutual movements of the pushing means, because each pushing means can be controlled independently from the other pushing means. With the drive equipment a stroke length S can be provided for the pushing means, having a length of a range of about ½ of the transfer channel length L. The stroke length S of the pushing means is of the same range of the height of the pushing means.

For ensuring the formation of the chip plug in the transfer channel, there can be arranged a stopper 7 delimiting the upper surface of the chip flow, said stopper 7 having preferably an adjustable location. This stopper can act as a densing means of the chip plug in the transfer channel 1, when the chips are moving under it forced by the pushing means 5. The transfer channel can also be formed converging in the feeding direction by mounting one or some of its walls inclined. The inclination of the walls can also be adjustable for adapting the operation of the apparatus for different situations.

The transfer channel can be divided with walls 9 parallel to the direction of the channel into compartments 8 each of them having their own pushing means 5. The pushing means 5 has substantially the same width and height as the compartment 8. The walls act for their part as guides for the pushing means, but the guiding can also be implemented with rails mounted on the bottom of the channel and adapted to the respective grooves in the pushing means 5.

The chip feeding apparatus in accordance with the present invention is also self-adjusting in the operation. In case the chip flow from the inlet connection stops, the pushing means 5 are not able to push new material to the transfer channel 1, but the chip plug made by the pushing means 5 remains in the transfer channel 1 preventing the gases and dust from coming to the inlet connection 2. Remaining of the chip plug dense in the transfer channel can be assisted with an apparatus, where the pushing means 5 are hydraulic or pneumatic separately used, whereby each pushing means are movable to its most extended position to support the chip plug.

At the discharge end of the transfer channel 1 there may be provided a gravity-operated hatch system 10, intended for acting as a non-return valve in situations, where the chip space coming after the discharge connection 4 is clearly pressurized, and the chip feed for some reason stops from the inlet connection 2.

The density of the chip plug sets substantially to the same in different loading situations of usage, whether there is more or momentarily less chip feed. The feeding amount is adjusted by means of the speed control of the crank mechanism 6 or correspondingly by means of a periodical operation of the hydraulic or pneumatic drive.

The embodiments of the present invention for which an exclusive property or privilege is claimed are defined as follows:

1. A feeding apparatus for feeding chips into a chip bin, in which apparatus the chips are forced to move substantially as a plug filling a cross-section of a transfer space, said apparatus comprising a chip transfer channel having a length, a chip inlet connection opening to the transfer channel , pushing means located on an opening area of the inlet connection to the transfer channel performing a reciprocal movement in longitudinal direction of the transfer channel for transferring the chips in the transfer channel, and a discharge connection leading from the transfer channel to the chip bin, characterized in that a length of stroke of the pushing means is substantially a minor part of the length of the transfer channel and that a plurality of pushing means are located side by side having a total operation area corresponding substantially to a cross-sectional area of the transfer channel and that the pushing means operate alternatively, whereby at least one of them is moving out of phase with the others.

2. The feeding apparatus in accordance with claim 1, wherein the stroke length of the pushing means is 1/5 – 1/3 of the length of the transfer channel.

3. The feeding apparatus in accordance with claim 1 or 2, wherein each pushing means is arranged to operate in a separate compartment extending along the length of the transfer channel and having a width that is substantially the same as a width of the corresponding pushing means.

4. The feeding apparatus according to any one of claims 1 to 3, wherein the transfer channel is provided with at least one wall having an adjustable inclination.

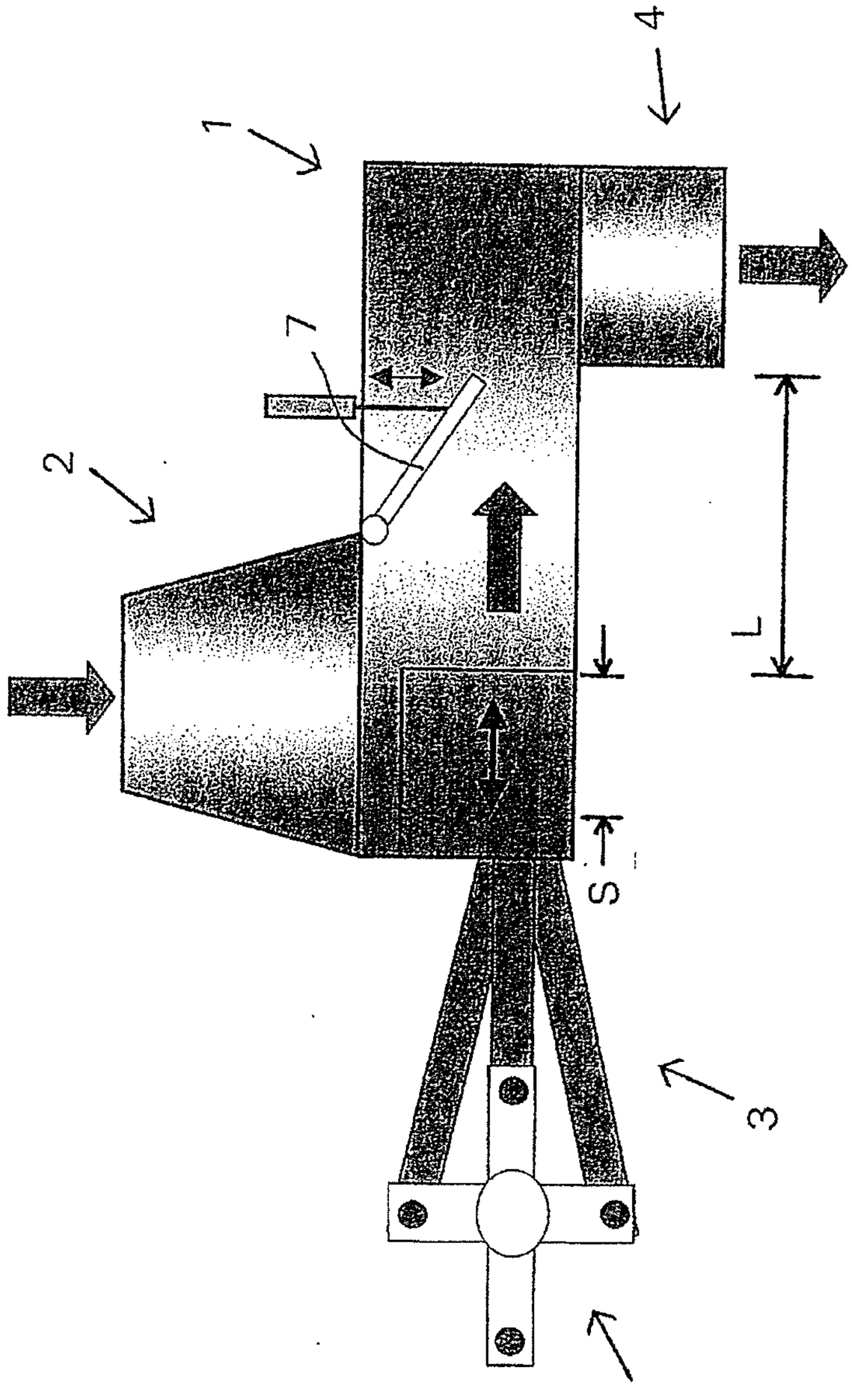


Fig. 1

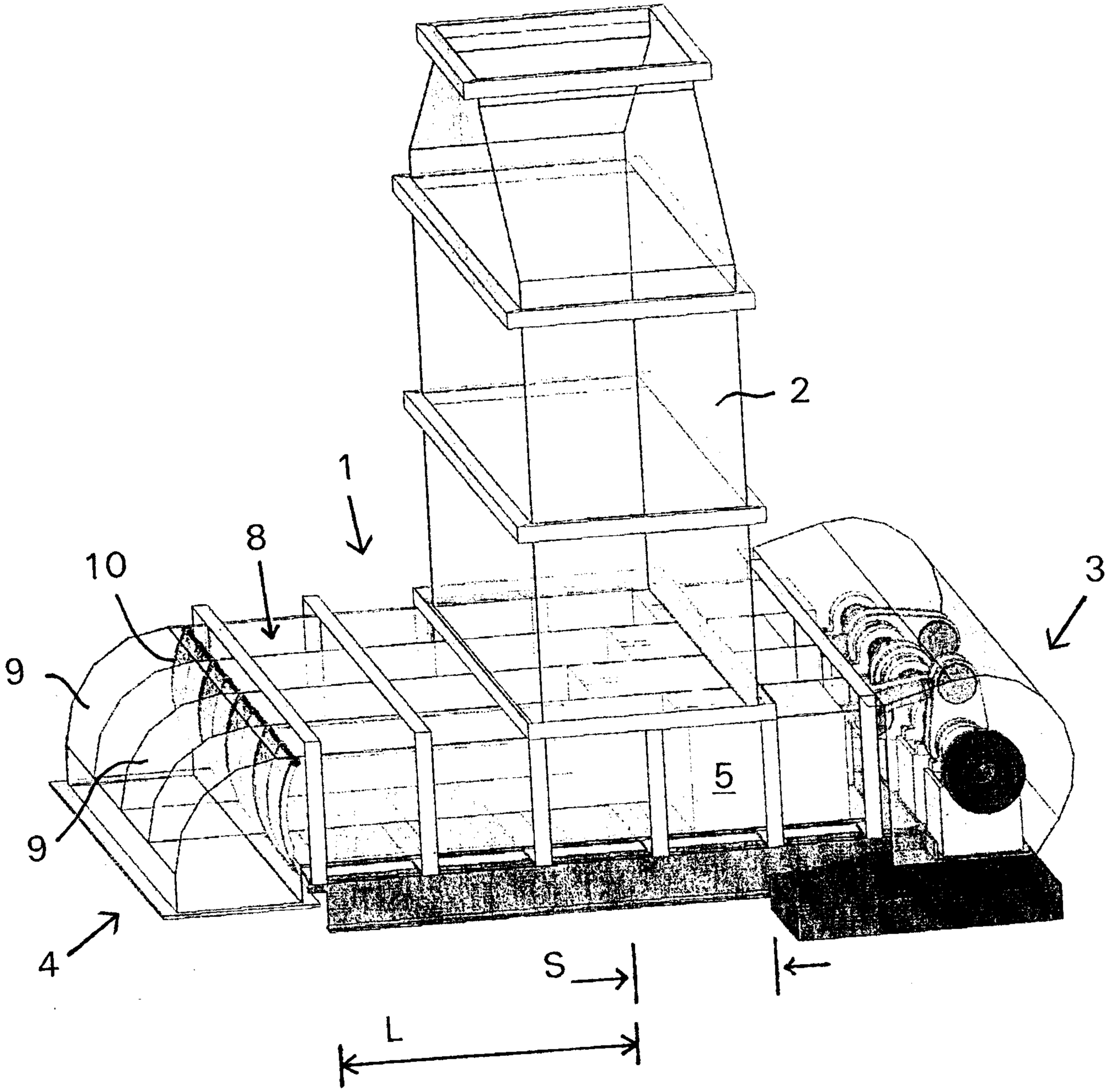
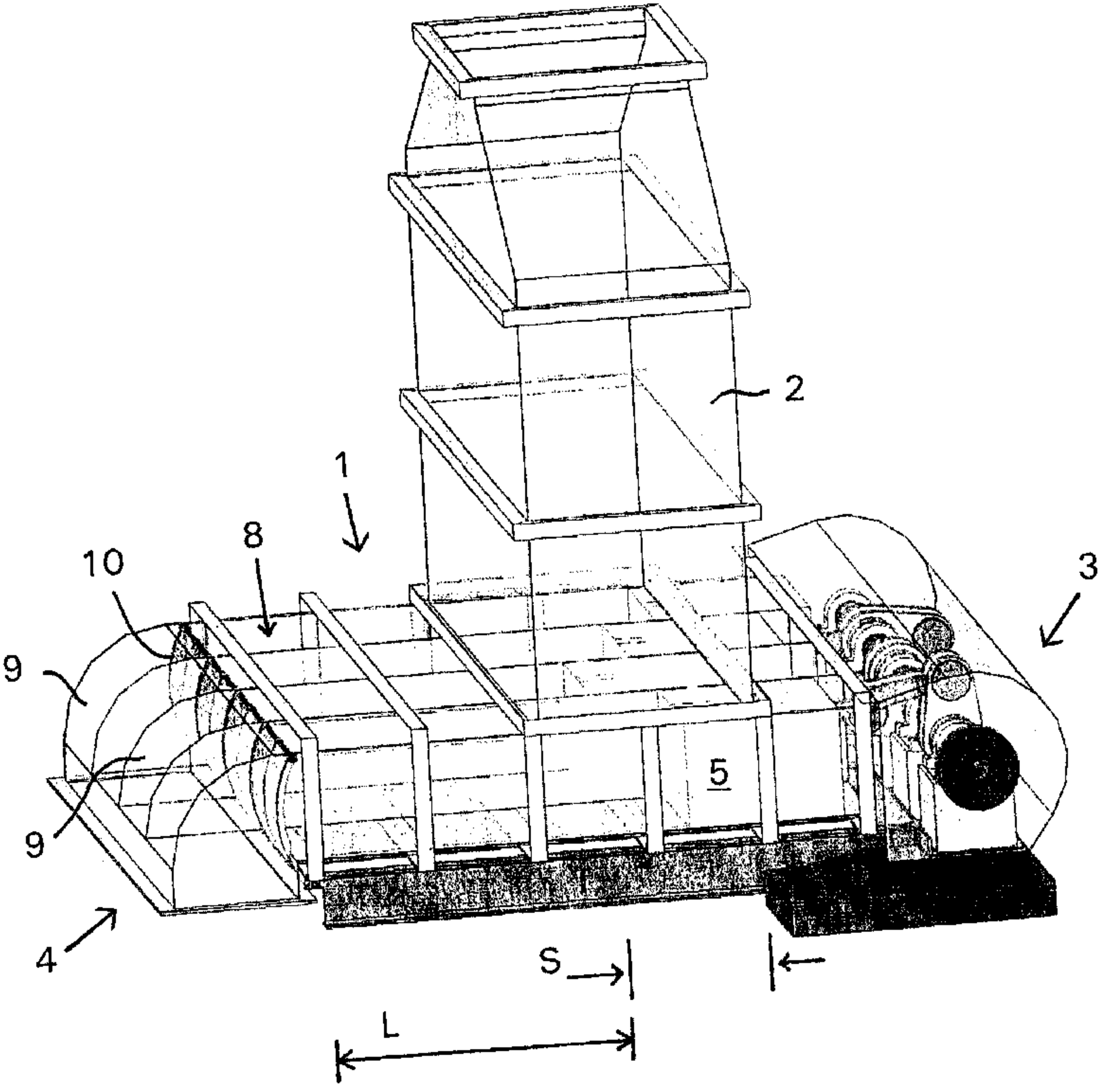


Fig. 2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