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(54) Exhaustion device for the removal of the dust produced by cutting paperboard, paper and the like

(57) Dust exhaustion device suitable for the removal of dusty residues and the like produced on the machines for the rectilinear cutting of paperboard sheets and the like by a discoid cutting blade; said device is constituted by an upper suction duct (1a), located parallel to the cutting blade (9), and so arched as to expose its suction mouth (1c) before said blade; there being also provided a suction duct (2) located under the cutting top, downstream of said discoid blade and connected to said suitably perforated top through a grooved drilled plate (3)
Said upper suction duct (1a) and said lower suction duct (2) being then connected to a suction unit (14) with the interposition of at least a filtering unit (15) for the collection of the residues exhausted through said two ducts.

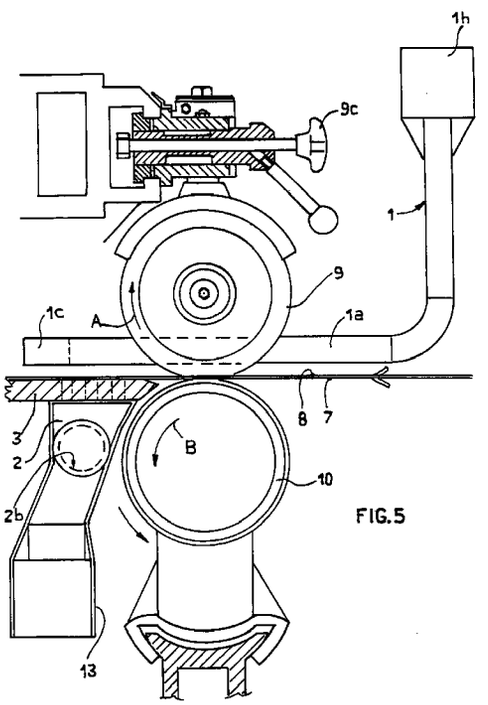

FIG.5

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Description

The present invention relates to a suction dust exhaustion device particularly suitable for the continuous removal of dusty residues and foreign bodies produced during the longitudinal cutting of paperboard and paper sheets and the like on the conventional discoid blade cutting machines.

As is known, cutting in parallel strips big-sized paperboard, bristol board and the like is at present carried out on longitudinal cutting machines having horizontal axis discoid blades, acting on counter-blades that are also discoid and motor-driven; generally, said machines have several cutting blades parallel with each other and whose mutual distance and height is adjustable with respect to the corresponding discoid counter-blades, in order to carry out at once several longitudinal cuttings on paperboard sheets of various thickness.

It is also known that each group comprising a discoid cutting blade, the associated motor-driven counter-blade and the kinematic gears for the transmission of motion and the adjustment of both blades, constitutes a cutting unit which, during the cutting stage, unavoidably produces dusty residues or the detachment of products that are possibly present on the faces of the paperboard sheet, which are at present usually removed by suction carried out in the inside of hoods located at the sides of the cutting disk, i.e. in correspondence of the cutting zone; besides, to ensure a correct suction of the dusty residues, said suction hoods are so sized as to concern a wide area both before and behind the actual cutting zone.

In practice, these suction hoods of the known art require therefore a strong suction current in order to remove the dusty residues and to convey them, as they are noxious, outside the work environment; on the other hand, as said dusty residues form only downstream of the cutting zone and not upstream of the same, the presence of the hood upstream of the cutting zone involves a suction that is actually useless; i.e. it involves a consumption of suction air which does not concern the zone where dusty residues form; besides, the suction hoods of the known art have also the drawback of uselessly exhausting also room air, because of the high volume of suction air applied to the same.

Therefore, object of the invention is to provide a dust exhaust device of the suction type, to exhaust the dusty residues produced by the rectilinear cutting of paperboard sheets and the like, so designed and structured as to eliminate the drawbacks and the limitations of the suction hoods of the known art that are provided on the machines having discoid cutting blades, and above all as to be able carry out a correct and complete suction of said residues with a highly reduced volume of suction air with respect to that required by the present systems.

Another object of the invention is to provide a dust exhaust device of the aforesaid type, so structured as to allow suction both above and under the zone downstream of the actual cutting zone, with extremely reduced overall dimensions, and therefore with the advantage of being of easily applicable on the present machines with discoid cutting blades, without requiring particular changes in the same machines.

A further object of the invention is to provide a dust exhaust device equipped with means suitable to allow the air exhausted from the cutting zone, i.e. an air that is purified from the dust produced by cuttings, to be let directly in the work environment.

These and still other objects that will be more clearly stressed in the following are achieved by a device for the dust exhaustion of the air exhausted from the cutting zones of machines intended for the rectilinear cutting of paperboard, paper and the like by means of cutting units of the type with discoid blades idle-mounted and rotary dragged by counter-blades also discoid and motor-driven, which device is constituted, according to the present invention, by a first suction duct, located above the sliding plane of the paperboard sheet and parallel to the discoid cutting blade and then so arched as to expose its inlet mouth downstream of the cutting zone before the very blade where dusty residues form, and by a second suction duct either located under or forming the sliding plane of the sheet and practically downstream of the cutting zone, said second duct being exposed with its inlet mouth connected, through a tubular union and a drilled and grooved plate, to the same sliding plane suitably provided with through- perforations, the opposite free ends of said first and said second suction ducts being then connected to at least a suction unit, substantially a fan, by means of flexible pipings or the like, there being interposed between the fan and the suction ducts at least a filtering unit for the collection of exhausted dust before letting the exhausted air in the work environment or outside the same.

More particularly, said first suction duct with the inlet mouth positioned before the discoid blade has preferably a substantially quadrangular cross-section, as well as a restraint flange substantially parallel to the suction duct, so as to allow the discoid blade to rotate between the duct and the flange, preventing at the same time a dispersal of the cutting residues and the air exhausted by the inlet mouth of said first suction duct.

Besides, two separate filters may be provided for the first and the second suction duct, as well as two separate suction units connected to said first respectively said second suction duct.

Further characteristics and advantages of the present invention will be more apparent thanks to the following detailed description, made with reference to the attached drawings, included by way of non limiting indication, wherein:

Figure 1 shows a prospect view of the upper suction duct only, illustrated separately from the cutting machine and realised according to the invention;

Figure 2 shows, always in prospect view, the tubular union for the anchoring of a suction duct under the cutting top;

Figures 3 and 3a show a sliding plate between the first tubular union of Figure 2 with the cutting top, respectively a longitudinal section of said plate along line III-III of Figure 3;

Figure 4 shows a partly sectioned side view of the kinematic gears that constitute the cutting zone of a known machine for the longitudinal cutting of paperboard webs, whereon the suction device of the present invention is mounted;

Figure 5 shows, on a magnified scale, the suction device of the present invention mounted on the cutting zone of Figure 4;

Figure 6 shows a simplified section along line VI-VI of Figure 5, while

Figure 7 shows, in a schematic form, the suction and filtration circuit only to which the dust exhaustion and suction device of the present invention is associated.

With reference to the aforementioned figures, the dust exhaustion device of the present invention is mainly constituted by three basic components, illustrated in Figures 1-3a.

As already said, this device is particularly designed and realised to work in correspondence of the cutting zone of a conventional machine with a discoid blade acting on an also discoid counter-blade, utilised for the longitudinal cutting of paperboard, bristol board, paper or like material, as will be better expounded later on.

Hence, with reference to Figures 1 and 2, the dust exhaustion suction device is constituted by a suction duct 1 (Fig. 1) located above the sliding plane of the sheet to be cut, and a suction duct 2 (Fig. 2), located under said sliding plane, a drilled and grooved plate 3 being interposed between the sliding plane and duct 2, as will be better explained later on.

More particularly, the upper suction duct 1 is constituted, according to a preferred non exclusive embodiment, by a tubular body 1a having a quadrangular section tapered towards end 1b where the same tube has a hollow arched zone 1c, with opening 1d substantially perpendicular to the longitudinal axis of duct 1a; outside said hollow arched zone 1c a foil 1e is integral which is slightly divaricated with respect to said axis. A plate 1f is located outside said hollow zone 1 c and along the base side of the foil or vertical flange 1e, having the function of circumscribing the zone between bodies 1a and 1e which, as will be better clarified later on, will form the suction zone from both sides of the cutting zone, with suction of the cutting residues through opening 1d of the hollow zone 1c.

Duct 1 is then connectable to another length of arched piping, indicated by 1g in the same Figure 1, which ends into a mouth 1h fitting with a flexible piping for the connection to the filtering system, as will be more clearly expounded later on.

The lower suction duct 2 (Fig. 2) is constituted by a tubular union 2a, provided with a length of internal threading 2b at both opposite ends; transversally to union 2a quadrangular hopper 2c is located that ends into the cavity of the union, said hopper being provided in the upper part with peripheral holes 2d for the connection with a grooved and drilled plate 3, shown in prospect in Figure 3 and in section in Figure 3a.

More precisely, said plate 3a, having a substantially rectangular shape, has peripherally through-holes 3b suitable to anchoring by means of screws or the like plate 3 to the quadrangular flange of union 2 which, as said, has like holes 2d. Said plate 3 is provided with circular through-apertures 4-4a-4b and grooves 5-5a, etc., united to said apertures 4-4a-4b, suitable, as a whole, to collect the cutting residues and to convey them, during suction, in the inside of union 2 and from the latter to a filter through a flexible piping 6; said piping 6 (Figs. 4-5) is connectable to either threaded end 2b of union 2, according to the position of the filtering zone; the threaded end of the same union 2, not connected to said flexible piping 6, is obviously closed by a stopper (not shown).

The device constituted by said upper suction duct 1 and said lower suction duct 2-3, may be utilised on each cutting units of a known multi-blade machine, of the type having a discoid cutting blade rotary dragged by an also discoid motor-driven counter-blade, i.e. by a cutting unit such as, for instance, the one schematised in Figures 4-6.

More particularly, said cutting unit of a known type is generally constituted by a sliding plane 7 whereon a paperboard sheet or the like 8 is caused to advance; said cutting top is interrupted in correspondence of the discoid cutting blade 9 that carries out the longitudinal cutting of the paperboard against a counter-blade 10, also discoid, which is applied to a rotary support 10a, activated in its turn by a gearmotor (not shown).

Also the discoid blade 9 is associated to a freely rotary support 9a; besides, it is also vertically shiftable with respect to the cutting top 7 and horizontally shiftable through pneumatic adjustment means or also means hand-actionable by handwheel 9b (Fig. 4) respectively handwheel 9c (Fig. 5).

In this cutting unit, the paperboard sheet 7 is fed at the start by two opposite rollers 11-11a (Fig. 4) and, after the cutting, it is dragged by two like dragging rollers or cylinders 12-12a (Fig. 4).

The longitudinal cutting of paperboard 7 is carried out, as said, at first by lowering and shifting the cutting blade 9 towards the counter-blade, until the paperboard is cut into, and then by means of rotary dragging of the same blade 9, by contact with the arched part 10a of the counter-blade 10.

If paperboard 7 is fed as illustrated in Figures 4 and 5, the cut is carried out the cutting blade 9 that rotates according to arrow A, as it is dragged by the counter-

blade that rotates according to arrow B (Figures 4 and 5), and therefore the dusty residues form prevailingly if not entirely, downstream of the cutting zone, i.e. between the cutting blade and the two dragging rollers (12-12a); before the cutting point, i.e. between the cutting blade and the feed rollers 11-11a, there cannot form, obviously, dust or residues as the cutting is carried out in the zone of the cutting blade 9.

Therefore, the removal by suction of said paperboard dusty residues can be advantageously concentrated only in the zone downstream of the actual cutting point. The dust exhaustion device of the present invention is therefore so structured and positioned as to concern the zone downstream of the cutting point or section, as is clearly shown in Figures 4-6.

In fact, in said figures, the upper suction duct 1 is positioned by side and parallel with respect to the cutting blade 9, so as to allow the suction zone 1c, and more precisely the suction mouth 1d, to position before the cutting blade, while the vertical flange 1e of the same duct 1a is on the opposite part of the same cutting blade, as is clearly illustrated in Figure 6.

Therefore, the position of the suction mouth 1d of duct 1a allows to remove the cutting residues with a suction air volume which is reduced with respect to the known hoods that carry out suction both upstream and downstream of the cutting zone.

The lower suction duct, constituted by union 2 connected to the drilled and grooved plate 3, is applied under the sliding table 8 and more precisely in correspondence of the cutting zone downstream of blade 9. The suction carried out through the holes of plate 3 and the holes obtained in the sliding table allows to remove also the residues that might have not been exhausted by the upper duct 1a. Said duct 1 is associated to the support of the discoid cutting blade, while the lower duct 2 is fixed.

To one of the threaded holes 2b a sleeve or union 13 is connected which, through a flexible pipe 6, is connected to a filtering and then suction unit, as shown in Figure 7.

Said Figure 7 shows schematically a suction and filtering circuit for dusty residues produced by several cutting units placed at equidistance to each other on one longitudinal cutting machine.

This suction and filtering unit is substantially constituted by a fan 14, connected to a filtering unit of a known type 15 through duct 16; said filtering unit is then connected, through a union 17 and a piping 19 designed to be connected to outlet 1h of several cutting units, said outlets being schematised as gates 18, 18a, etc.; the same upper union 17 is then connected, through a rigid or flexible piping 20, connectable in its turn, through unions 21, 21a, etc. to outlets 6a of pipes 6 (Fig. 4), connected to the lower suction duct 2, 3.

Said filter 15 is then provided with means to convey, through a union 22 (Fig. 7), air for cleaning both the filter and ducts 19-20 and therefore also the upper and lower suction ducts of each cutting unit connected to said exhauster 14; besides, to filter 15 a collector is associated for the separate dusts, indicated by 15a in Figure 7.

Obviously, the dust exhaust devices provided on a same cutting machine may be associated groupwise, the groups being connected, in their turn, to two or more separate fans-exhausters.

The presence of these filtering means allow the continuous re-entering in the work environment of the air exhausted and purified from both dusty residues produced by cuttings and other powders that may be possibly present in said work environment.

In the same way, always according to the present invention, said second suction duct (2) may be constituted by a tubular body, so sized and shaped that it can be housed between the voids existing between the various cutting units 18-18a, and arranged with its inlet mouth directly at the level of the sliding plane, the opposite end of said tubular body being connected to an exhaust unit, substantially the one already provided for the suction of offcuts and other dusty wastes or the like.

Claims

1. A dust exhaustion device for the air exhausted from the cutting zone of machines intended for the longitudinal cutting of paperboard, paper sheets and the like by a cutting unit of the type with discoid blades (9) idle-mounted and rotary dragged by counter-blades (10) also discoid and motor-driven, characterised in that it is constituted by a first suction duct (1a), located above the sliding plane (7) of the paperboard web (8) and parallel to the discoid cutting blade (9) and then so arched as to expose its inlet mouth (1d) downstream of the cutting zone and practically in the zone before said blade (9), wherein dusty residues form, and by a second suction duct (2), located under or forming the sliding plane (7) of the sheet and practically downstream of the cutting zone, said second duct (2) exposing its inlet mouth (2b), connected through a tubular union (2c) and a drilled and grooved plate (3), to the same sliding plane (7), suitably provided with through-perforations, the opposite free ends of said first and second suction ducts being then connected to at least a suction unit (14) substantially a fan, by means of flexible pipings (16, 19, 20) or the like, at least a filtering unit (15, 15a) being interposed between fan (14) and the suction ducts (1a, 2) for the collection of the dusts exhausted before letting the exhausted air in the work environment or outside of the same.

2. The dust exhaustion device according to claim 1, characterised in that said first suction duct (1a) with the inlet mouth (1c) positioned before the discoid blade (9) has preferably a substantially quadrangular cross-section, as well as a restraint flange (1e)

substantially parallel to the suction duct (1a), so as to allow the discoid blade (9) to rotate between duct (1a) and flange (1e), preventing at the same time a dispersion of the residues and of the air exhausted through the inlet mouth (1c) of said first suction duct (1a).

3. The dust exhaustion device according to claim 1, characterised in that it has two separate filters (15) interposed between the first suction duct (1a) and the second suction duct (2), as well as two separate suction units connected to said first respectively said second suction duct.

4. The dust exhaustion device according to claim 1, characterised in that said second lower suction duct (2) is constituted by a tubular length which is transversally provided with a peripheral flange provided with holes (2d) for its anchoring to said drilled and grooved plate (3), as well as with threaded lengths (2b) at the opposite ends, for the alternated connection to a flexible piping (6) connected to said filtering unit (15).

5. The dust exhaustion device according to one or more of the preceding claims, characterised in that said upper suction duct (1) is anchored to the means for the support and adjustment of the discoid cutting blade (9), while the lower suction duct (2) is anchored to the counter-blade, in such a way as to keep their relative position stable, whatever the shifting of the unit made up by the cutting blade and the associated counter-blade (10) required by the cutting needs.

6. The dust exhaustion device according to one or more of the preceding claims, characterised in that said second suction duct (2) is constituted by a tubular body so sized and shaped that it can be housed between the voids existing between the various cutting units (18-18a) and positioned with its inlet mouth directly at the level of the sliding plane (7), and down stream the cutting zone, the opposite end of said tubular body being then connected to a suction unit, substantially the one already provided for the suction of offcuts and other dusty wastes or the like.

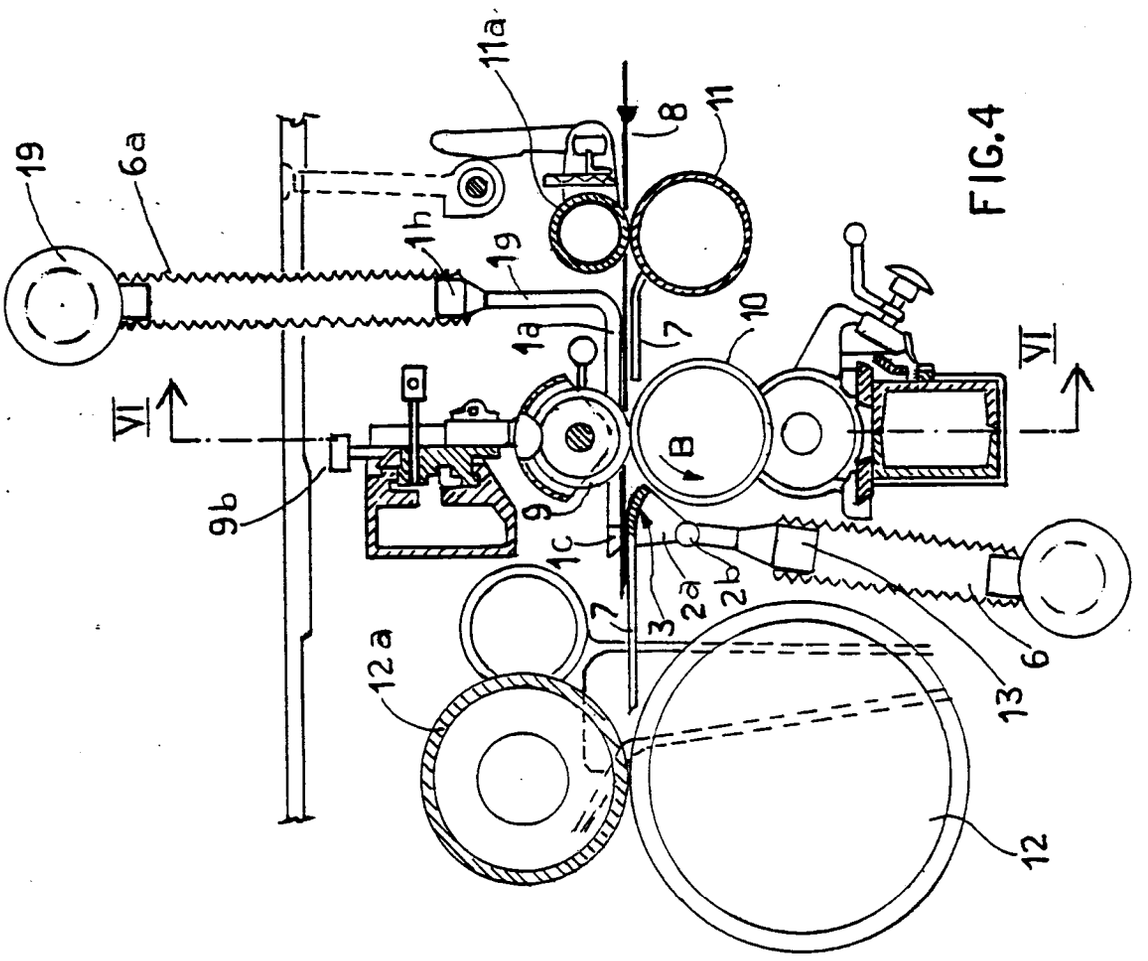

FIG.4

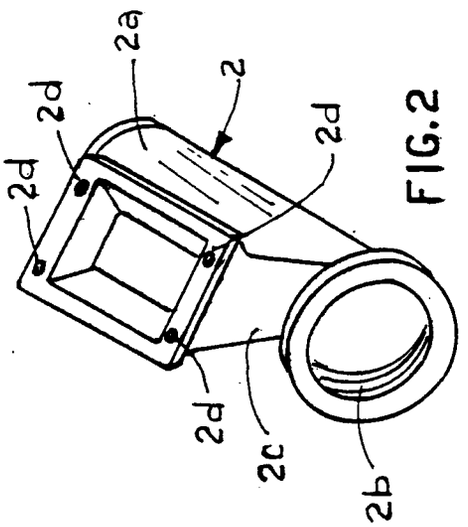

FIG.2

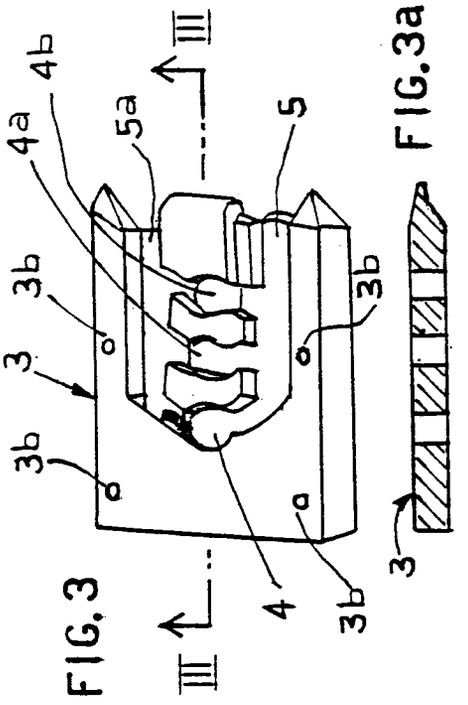

FIG.3

FIG.3a

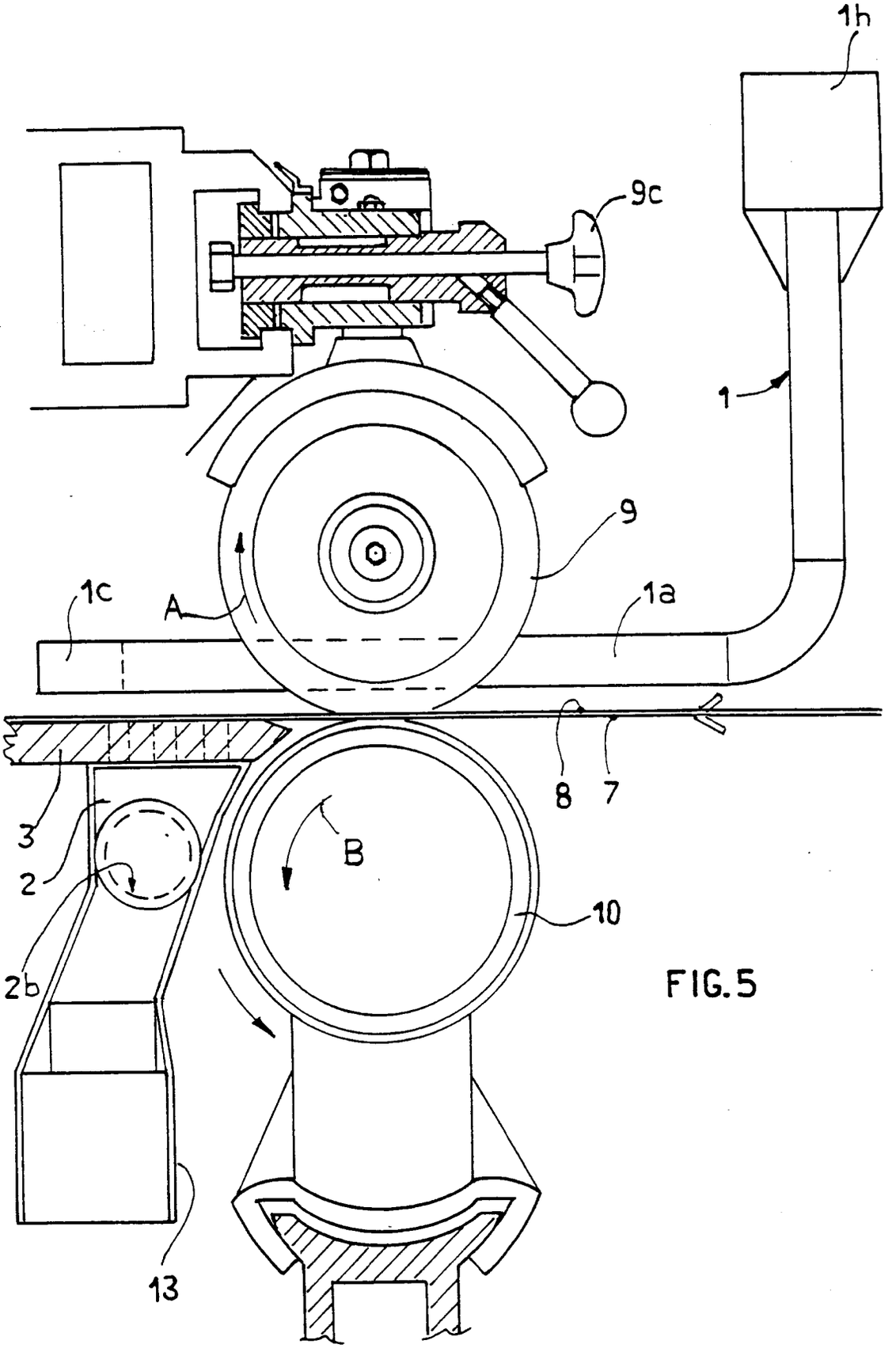

FIG.5

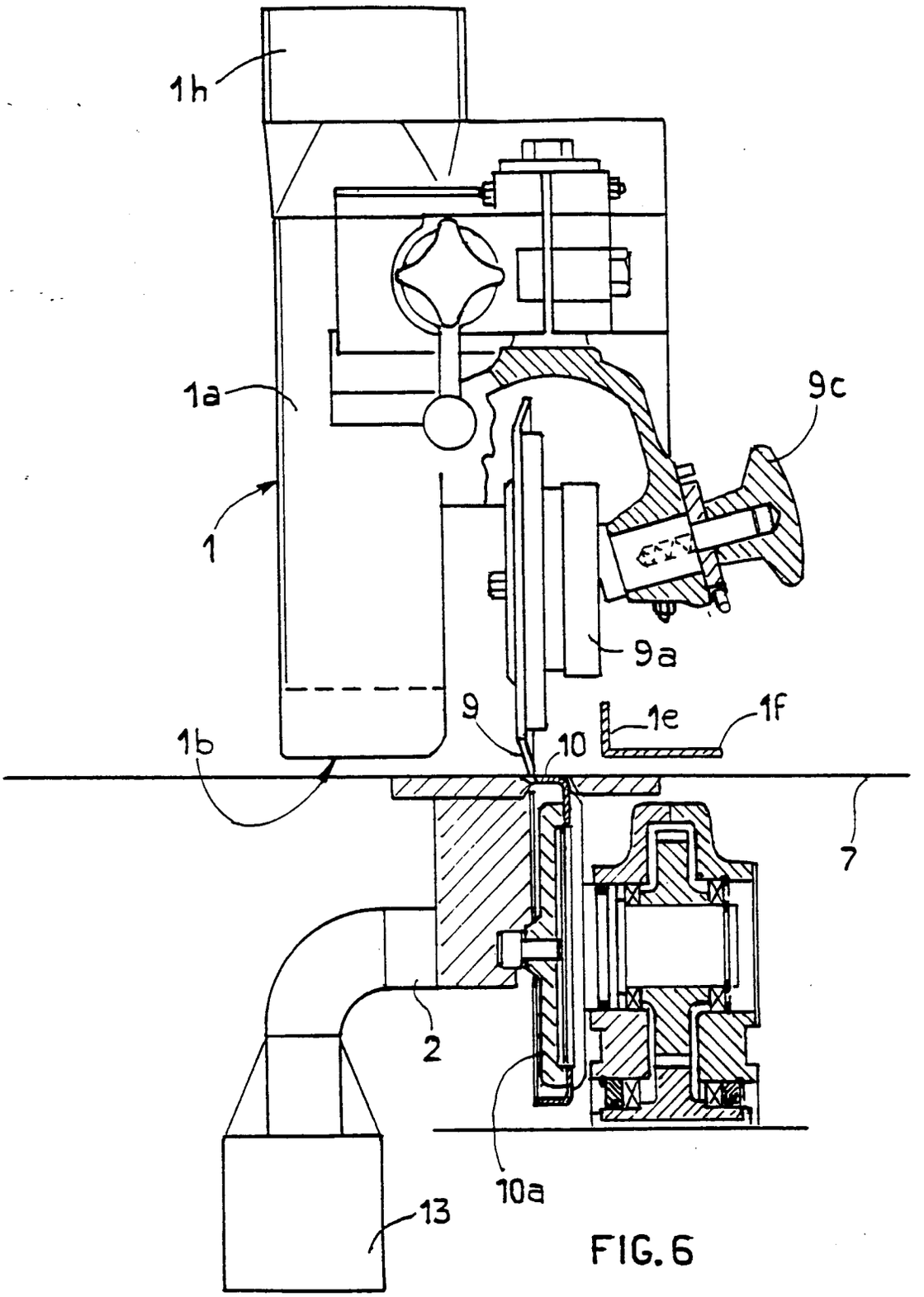

FIG. 6

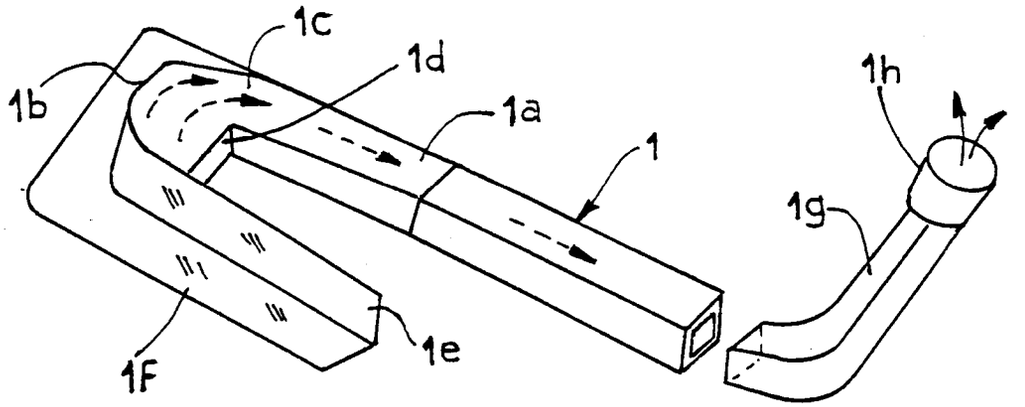

FIG.1

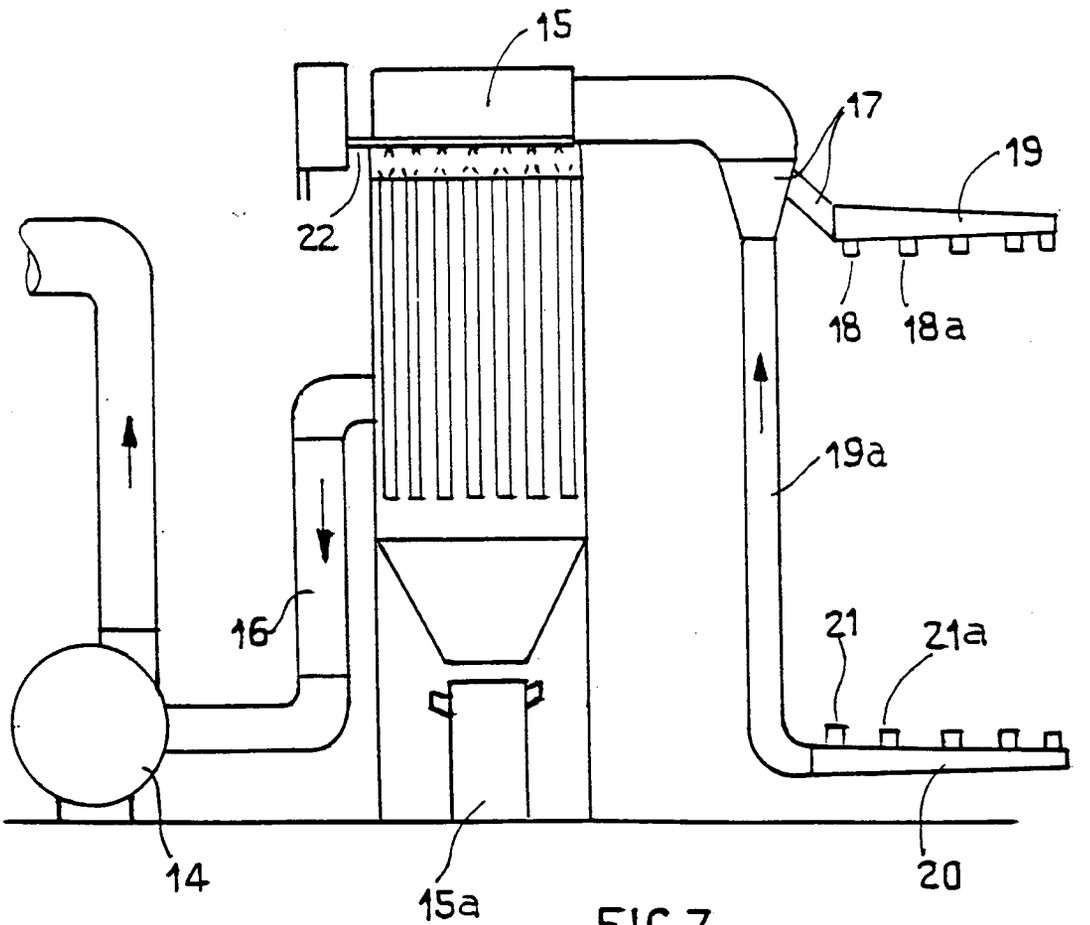

FIG.7