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(71) Applicant: **Pisek - Vitli Krpan, d.o.o.**
3240 Smarje pri Jelsah (SI)

(72) Inventor: **PISEK, Franc**
3240 Smarje pri Jelsah (SI)

(74) Representative: **Patentni Biro AF d.o.o.**
Kotnikova 32, p.p. 2706
1001 Ljubljana (SI)

(54) A BUILT-IN SUCTION UNIT FOR A CUTTING OR CUTTING-SPLITTING MACHINE

(57) The present invention belongs to the field of working machines, more precisely to the field of expulsion and suction of sawdust in cutting and cutting-splitting machines. The invention relates to a built-in suction unit for a cutting or a cutting-splitting machine and machines with said suction unit. The essence of the invention is in that the drive of the suction unit is the drive of the splitting or cutting-splitting machine, wherein the fan (2) of the suction unit is connected to the axle (3) of the machine, drive pulley (15, 4), sprocket wheel or cogwheel of the machine, which is connected to the rotatable part of the drive, or to a PTO shaft driving said machine. The connection of the suction unit with the fan (2) arranged to suck sawdust from the supply channel (11) to the expulsion channel (12) to the axle (3) may be achieved with belt (4), chain, teeth, or similar torque transmission systems. The fan (2) sucks the sawdust from the supply channel (11) to the expulsion channel (12) with an outlet (1B) to a collector, which is a bag or a suitably shaped container. The construction of the suction unit enables operation of the suction unit simultaneously with the machine, which means that the sawdust is efficiently removed and collected in the collector.

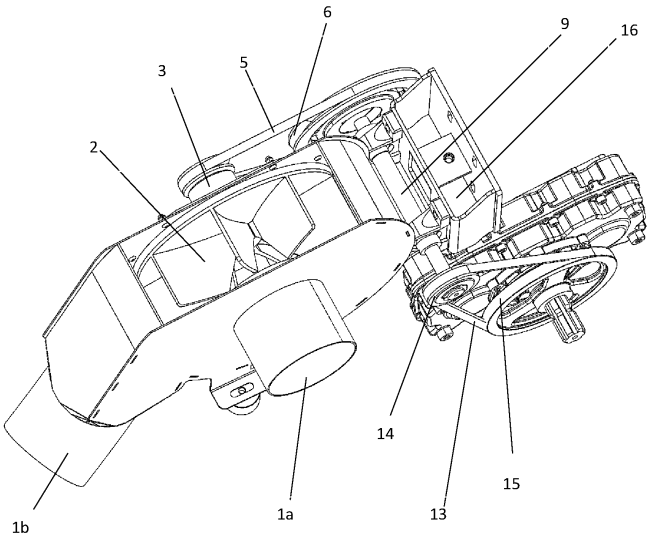

Figure 2c

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Description

Field of the invention

[0001] The present invention belongs to the field of working machines, more precisely to the field of expulsion and suction of sawdust in cutting and cutting-splitting machines. The invention relates to a built-in suction unit for a cutting or a cutting-splitting machine and machines with said suction unit.

Background of the invention and the technical problem

[0002] Wood is widely used for heating, but has to be suitably shaped and sized for use. During log processing wood trunks are cut into logs having a size and shape corresponding to fireplaces, furnaces, and stoves, so that no further cutting or splitting is necessary. Different wood processing devices are known, which cut and split trunks with minimal manual handling. Sawdust is a side product of wood splitting, which can accumulate and/or fly towards the user of the cutting-splitting machine. To prevent or limit this, numerous machines have special outlets or pipes for leading sawdust, as described in documents US4621668 in US2075282. Alternatively, machines have built-in suction units that ensure sawdust removal and its transport to the exterior of the machine, for example into suitable container. Said suction units may be external or independent units connectable to the machine, or internal, i.e., built in the machine itself.

[0003] Known suction units are driven with their drive, which is hydraulic or separate electromotor or a hydromotor. The disadvantage of the latter is in that the machine must be always placed near an electricity source in order to allow operation of the suction unit. This is often not the case, particularly during field work. Consequently, suction is not operating, the sawdust is not removed and is flying all over the space, thus hampering and slowing work, which consequently affects productivity. Hydraulically driven suction devices have disadvantages, as they burden the hydraulic system of the machine, thereby influencing optimal work with the machine and its life span. In such cases, larger pumps, oil reservoirs, valves, and pipes are required, which is not economical.

[0004] The technical problem is thus solving disadvantages of known suction units and optimization of their drive.

Prior art

[0005] Utility model CN205343349 describes a log splitter having in its bottom part a device for removing sawdust, which is arranged to remove the sawdust away from the user via pipes. A similar solution is disclosed in patent application EP1878526A according to which a circular saw has a housing with an outlet for sawdust, to which a collecting container is mounted.

[0006] Patent application US4228708A describes a cutting-splitting device having a system for collecting sawdust with a cover around blades of the saw and an outlet pipe arranged near said blades. The device is driven with a motor installed on a holder with an axis and wheels.

[0007] Patent application GB776039 discloses a machine for cutting trunks into logs, which is provided with cutting blades driven with at least one motor. At the same time the machine has a device for sawdust removal, which is essentially an infinite conveyor driven with a second motor.

[0008] All described solutions differ from the present invention in that these suction units do not have a drive or have their own separate drives.

Description of the solution to the technical problem

[0009] The technical problem is solved as defined in the independent claim, while the preferred embodiments of the solution to the technical problem are defined in dependent claims.

[0010] The essence of the invention is in that the drive of the suction unit is connected to the drive of the cutting or splitting-cutting machine, wherein a fan of the suction unit is directly or indirectly via at least one transmission connected to an axle of the machine, for example to a drive pulley attached to a rotatable part of the drive, or to a PTO shaft via which the cutting or splitting-cutting machine is driven. The connection of the fan to the axle may be achieved with belts, chains, teeth or similar torque transmission from the main axle. The ventilator sucks (vacuums) the sawdust from a collecting or supply channel to a collecting container, which may be a bag or a suitably shaped container. The construction of the suction unit enables that suction is performed every time together with operation of the machine, which means that the sawdust is regularly removed and collected in the suitable collecting container.

[0011] According to a preferred embodiment the suction unit comprises:

- a housing inside which a fan is installed, an inlet for connection to a supply channel and an outlet for connection to an expulsion channel,
- the fan, which is rigidly connected to an axle of the suction unit, on which a drive pulley, a chain or a sprocket wheel of the suction unit is installed, wherein said pulley, chain or a sprocket wheel of the suction unit is attached to the housing of the suction unit via said axle and a flange, and wherein the ventilator is arranged to create negative pressure with rotation, thus sucking sawdust from the supply channel, preferably pipe, and directing the sawdust via the expulsion channel, preferably pipe, to the exterior of the unit into a suitable container, which may be a bag or a similar container for collection of sawdust,
- the supply channel having a first end installed in the interior of the machine and a second end installed

on the said inlet of the housing of the suction unit,

- the expulsion channel mounted on the outlet of the housing, whereas its second end is outside of the machine or ends at the end of the housing,
  Wherein the end of the expulsion channel is optionally provided with a bag, a container or any other element arranged to collect sawdust, and the end of the expulsion channel is optionally provided with a suitable flange or a similar element for improved connection to the bag or any other suitable sawdust container, and
- arbitrary installation plates or similar elements for fixing the housing of the suction unit into the cutting or cutting-splitting machine, wherein said fixation may be achieved in any suitable manner, preferably by screwing.

[0012] The supply channel is preferably led into the centre of the side plate of the housing, but it can be led to any other part of the housing with the fan, wherein connection is achieved by welding or any other suitable manner of connection. The opposite end of the supply channel is located in the interior of the machine, where sawdust is generated during operation (wood cutting/splitting). Due to simultaneous operation of the suction unit and the machine, negative pressure created by the fan leads the generated sawdust from the interior of the machine via the supply channel towards the fan, where the sawdust is further directed to the expulsion channel, which leads the sawdust to the exterior of the machine, preferably to the suitable container.

[0013] Preferably, the connection to the drive is achieved with at least one transmission, however, two or more transmissions are also possible, depending on the machine drive as well as the position of the suction unit. The most preferred embodiment of the invention connects the drive of the machine with the drive unit (preferably pulley) of the suction unit or the fan, respectively, via driven belt transmission, which then drives the suction unit. The drive pulley of the machine is affixed to a rotating part of one of rotatable axles on the machine or the PTO shaft, which is located on the hydraulic pump or multiplicator, to which the hydraulic pump is connected.

[0014] Said drive pulley is in case of the PTO shaft preferably rigidly connected to the PTO shaft via a seat and screws. The power for driving the pulley is taken from the PTO shaft, which is connected to a tractor or an electric drive. The drive pulley via a wedge belt connected to a smaller pulley located on a tightening holder on the frame of the machine, wherein said holder for tightening of the pulley ensures suitable setting of pulley tension. Tensioning may be achieved in any suitable manner known to a skilled person. Said smaller intermediate pulley is via a bearing-supported connecting shaft connected to a large pulley of the suction unit and consequently to the drive pulley of the suction unit, which are connected one with another with a second wedge belt. The drive pulley is connected to the fan as described above. The connecting shaft may be protected with any suitable protective plate, sheet metal or any other similar element. In case instead of pulleys and belts, a chain transmission was used, the construction is entirely analogous, which is clear to a skilled person.

[0015] According to an alternative embodiment, in which the PTO shaft is not used, the drive pulley of the fan is connected with the large pulley via the wedge belt, wherein said large pulley is attached to one end of the axle, which is on the other end rigidly connected to one of the rotating axles of the cutting or cutting-splitting machine. Said connecting shaft may be connected to the small pulley instead of the direct connection to the rotating parts, said small pulley being connected with the second wedge belt to the drive pulley of the cutting or cutting-splitting machine. The mentioned connecting shaft is to each pulley connected through a coupling or any other machine element for torque transmission. In addition, the shaft may be protected against damages with protective sheet metal, plate or similar attached to the housing of the suction unit. The size of the pulleys depends on the necessary transmission ratio depending on the input rotation or final rotation in case of gears. Theoretically, the smaller and larger pulley could have the same size, however, it is optimal if they have different dimensions. The same manner of connection may also be used in case of chains and sprockets.

[0016] The suction unit is installed in any cutting or cutting-splitting machine, where it is attached to the frame in any suitable manner. The invention enables suction or collection of sawdust during cutting into a bag or a container, wherein expulsion of sawdust towards the user is reduced.

[0017] The built-in suction unit for cutting and cutting-splitting machines and the machine with said suction unit will be described in further detail based on exemplary embodiments and figures, which show:

Figure 1a	Isometric front view of the suction unit according to a first embodiment
Figure 1b	Elevation view of the suction unit according to the first embodiment from the interior of the machine with the built-in suction unit
Figure 2a	Elevation view of the suction unit according to a second embodiment
Figure 2b	Elevation view of the suction unit according to the second embodiment from the interior of the machine with the built-in suction unit
Figure 2c	The suction unit according to the second embodiment from above

[0018] The suction unit as shown in figures 1 and 2 comprises:

- a housing 1 inside which a fan 2 is installed, an inlet 1a for connection to a supply channel 11 and an outlet 1b for connection to an expulsion channel 12,
- the fan 2, which is rigidly connected to an axle 3, on

which a drive pulley 4 of the suction unit is installed, wherein said belt 4 of the suction unit is attached to the housing 1 of the suction unit via said axle 3 and a flange,

- the supply channel 11 having a first end installed in the interior of the machine and a second end installed on the said inlet 1a of the housing 1 with the fan 2,
- the expulsion channel 12 mounted on the outlet 1b of the housing 1, whereas its second end is outside of the machine or ends at the end of the housing, wherein the end of the expulsion channel 12 is optionally provided with a bag, a container or any other element arranged to collect sawdust, and the end of the expulsion channel 12 is optionally provided with a suitable flange or a similar element for improved connection to the bag or any other suitable sawdust container, and
- arbitrary installation plates 7, 8 or similar elements for fixation of the housing 1 of the suction unit into the cutting or cutting-splitting machine, wherein said fixation may be achieved in any suitable manner, preferably by screwing.

[0019] Figures 1a and 1b show the suction unit according to the first embodiment, wherein the connection to the drive of the machine is achieved by connecting the drive pulley 4 with the large pulley 6 of the suction unit via a wedge belt 5. The connecting shaft 9 is on one end connected with a connecting element, preferably a bush 10, to one of the rotatable shafts (axles) of the machine (not shown), while the other end is supported with a bearing mounted on a holder 7. Said connecting shaft 9 is connected to the large pulley 6 with a coupling in order to transmit torque from the drive of the machine via the connecting shaft 9 to the large pulley 6 and consequently to the drive pulley 4 of the suction unit, which in turn causes operation of the fan 2 and suction of the sawdust from the supply channel 11 to the expulsion channel 12. The suction unit has installation plates 7, 8 provided for installation of the suction unit into the housing of the cutting or cutting-splitting machine with screwing.

[0020] Figures 2a to 2c show an embodiment according to which the drive of the machine is achieved with a PTO shaft. The drive pulley 15 of the machine is fixed to a rotatable part of the PTO shaft. Said drive pulley 15 is rigidly connected to the PTO shaft with a seat and screws. The power for driving the pulley 15 is taken from the PTO shaft connected to a tractor or electric drive. The drive pulley 15 is via a wedge belt 13 connected to a smaller intermediate pulley 14, which is installed on a holder for tightening, which allows installation and optional tightening of belts, which is sometimes required. Said smaller intermediate pulley 14 is through the bearing-supported connecting shaft 9 connected to the large pulley 6 of the suction unit and consequently to the drive pulley 4 of the suction unit, which are connected with the second wedge belt 5. The drive pulley 4 is connected to the fan 2 in the same manner as described for the first embodiment above. The connecting shaft 9 is protected with a suitable protective plate, sheet, or similar element 16. Thus, the torque is transmitted from the drive pulley 15 of the machine, the intermediate smaller pulley 14, the connecting shaft 9 and the large pulley 6 to the drive pulley 4 of the suction unit, which causes operation of the fan 2 and suction of the sawdust from the supply channel 11 into the expulsion channel 12.

Claims

1. A cutting or a cutting-splitting machine with a built-in suction unit, **characterized in that** said suction unit is driven by a connection to a drive of the machine, wherein the fan of the suction unit is directly or indirectly connected to the drive of the machine or is connected to a PTO shaft arranged to drive said machine.

2. The cutting or a cutting-splitting machine with a built-in suction unit according to claim 1, wherein the connection of the fan to the drive of the machine is indirect and is achieved with a belt, chain, teeth or any other torque transmission elements.

3. The cutting or a cutting-splitting machine with a built-in suction unit according to claim 1 or claim 2, wherein the suction unit comprises:

   - a housing (1) inside which a fan (2) is installed, an inlet (1a) for connection to a supply channel (11) and an outlet (1b) for connection to an expulsion channel (12),
   - the fan (2), which is rigidly connected to an axle (3), on which a drive pulley (4), a sprocket or a cogwheel of the suction unit is installed, wherein said pulley (4) of the suction unit is attached to the housing (1) of the suction unit via said axle (3) and a flange, wherein the fan (2) is arranged to rotate and thus create a negative pressure in order to allow suction from the supply channel (11) to the expulsion channel (12) to the exterior, into a collecting bag or container,
   - the supply channel (11) having a first end installed in the interior of the machine and a second end installed on the said inlet (1a) of the housing (1) with the fan (2),
   - the expulsion channel (12) mounted on the outlet (1b) of the housing (1), whereas its second end is outside of the machine or ends at the end of the housing, and
   - arbitrary installation plates (7, 8) or similar elements for fixation of the housing of the suction unit into the cutting or cutting-splitting machine, wherein said fixation may be achieved in any suitable manner, preferably by screwing.

4. The cutting or a cutting-splitting machine with a built-in suction unit according to claim 3, wherein the supply channel (11) is lead to a side plate of the housing (1), in which the fan (2) is installed, wherein the connection is achieved with welding or any other connection manner, so that the supply channel ends in the interior of the machine, where sawdust is generated during cutting wood.

5. The cutting or a cutting-splitting machine with a built-in suction unit according to any of the preceding claims, wherein the connecting shaft (9) is protected with a suitable protective plate, sheet or a similar element.

6. The cutting or a cutting-splitting machine with a built-in suction unit according to any of the preceding claims, wherein on one end of the expulsion channel (12) the bag, the container or any other element for collection of sawdust is installed, said end of the expulsion channel (12) being optionally provided with a flange or a similar element for improved connection to the bag or container.

7. The cutting or a cutting-splitting machine with a built-in suction unit according to any of the preceding claims, wherein the drive of the machine is achieved via a PTO shaft and for connection of the machine drive with the drive of the suction unit or the fan, respectively, belt transmission is used, wherein:

- a drive pulley (15) of the machine is fixed to the PTO shaft, preferably the drive pulley (15) is rigidly connected to the PTO shaft via a seat and engaging screws and power of driving the pulley (15) is taken form the PTO shaft connected to a tractor or electric drive,
- the drive pulley (15) is with a wedge belt (13) connected to a smaller intermediate pulley (14) installed on a holder for tightening,
- said smaller intermediate pulley (14) is via the bearing supported connecting shaft (9) connected to the large pulley (6) of the suction unit and consequently to the drive pulley (4) of the suction unit, which are connected with a second wedge belt (5), and the drive pulley (4) of the suction unit is connected to the fan (2) in order to transmit torque from the pulley (15) of the machine to the large pulley (6) and the drive pulley (4) of the suction unit, which enables operation of the fan (2) and suction of the sawdust from the supply channel (11) into the expulsion channel (12).

8. The cutting or a cutting-splitting machine with a built-in suction unit according to any of the claims from 1 to 6, wherein the drive of the machine with the drive of the suction unit or the fan, respectively, belt transmission is used for driving the suction unit, wherein:

- the drive pulley (4) of the suction unit is connected to the large pulley (6) with a wedge belt (5), said large pulley (6) is through a coupling connected to the connecting shaft (9), wherein the other end of the shaft (9) is through a connecting element, preferably a bush (10) connected to one of the rotating axles of the machine, so that torque is transmitted to the large pulley (6) and the drive pulley (4) of the suction unit, which enables operation of the fan (2) and suction of the sawdust from the supply channel (11) into the expulsion channel (12),
- said connecting shaft (9) being connected to the large pulley (6) with a coupling, wherein the shaft (9) may be additionally protected with a protective plate attached to the housing of the suction unit.

9. The cutting or a cutting-splitting machine with a built-in suction unit according to any of the claims from 1 to 6, wherein for connection of the machine drive with the drive of the suction unit or the fan, respectively, belt transmission is used, wherein:

- The drive pulley of the machine is fixed to a rotatable part of one of the rotatable axles of the machine,
- The drive pulley of the fan is connected to the large pulley with a wedge belt, said large pulley being installed on one end of the shaft, which is on the other end provided with the small pulley, which is through a second wedge belt connected to the said drive pulley of the machine, so that torque is transmitted via the small pulley and connective shaft to the large pulley and consequently to the drive pulley of the suction unit, which enables operation of the fan and suction of the sawdust from the supply channel to the expulsion channel,
- said connecting shaft is to the pulleys, large and small, connected with a coupling, and the shaft may be additionally protected with a protective plate attached to the housing of the suction unit.

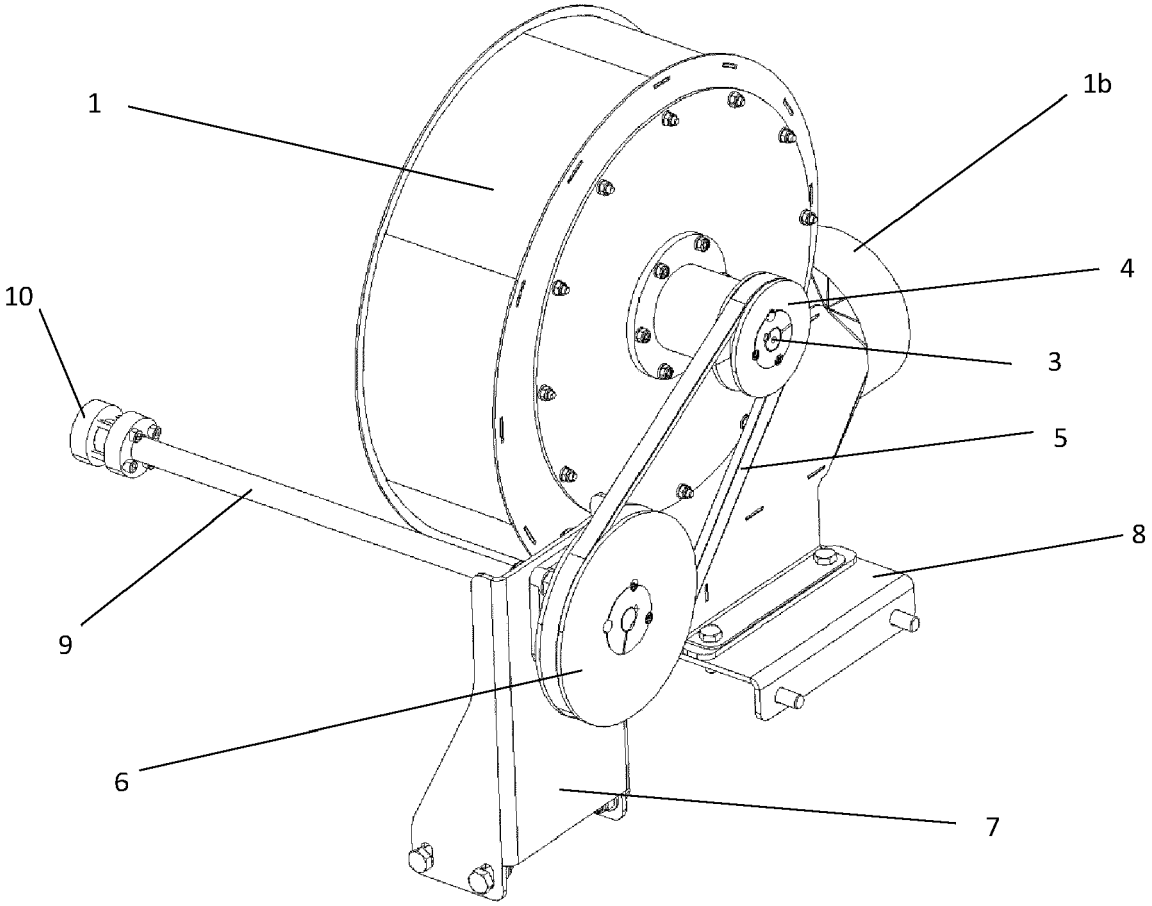

Figure 1a

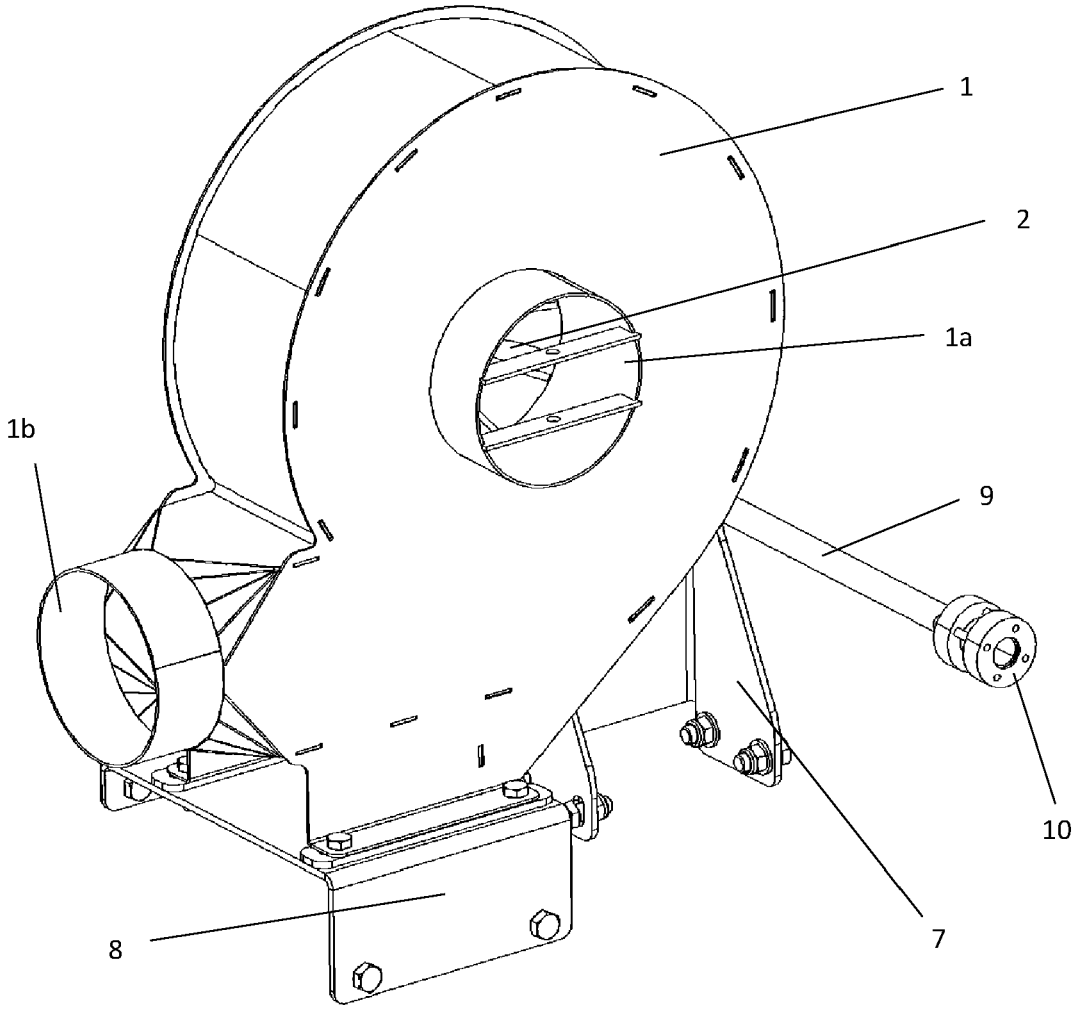

Figure 1b

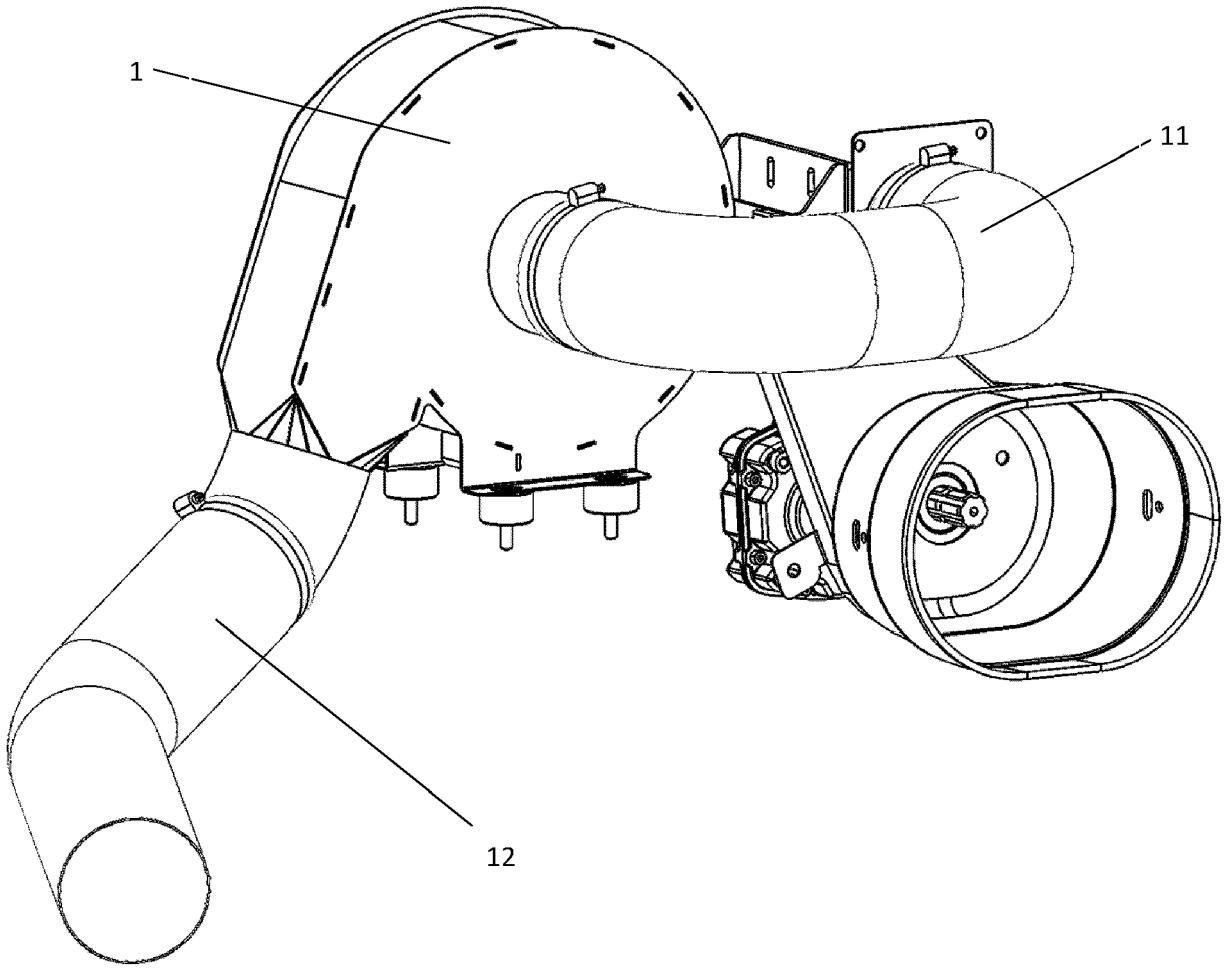

Figure 2a

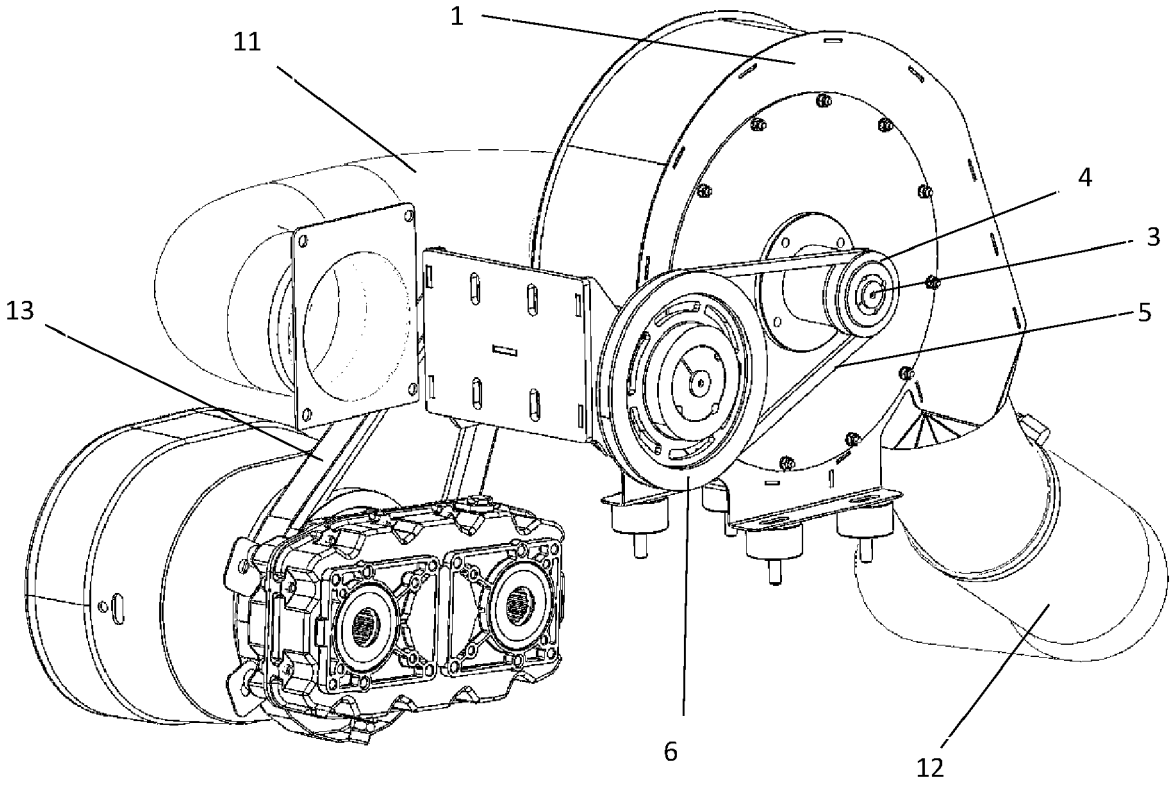

Figure 2b

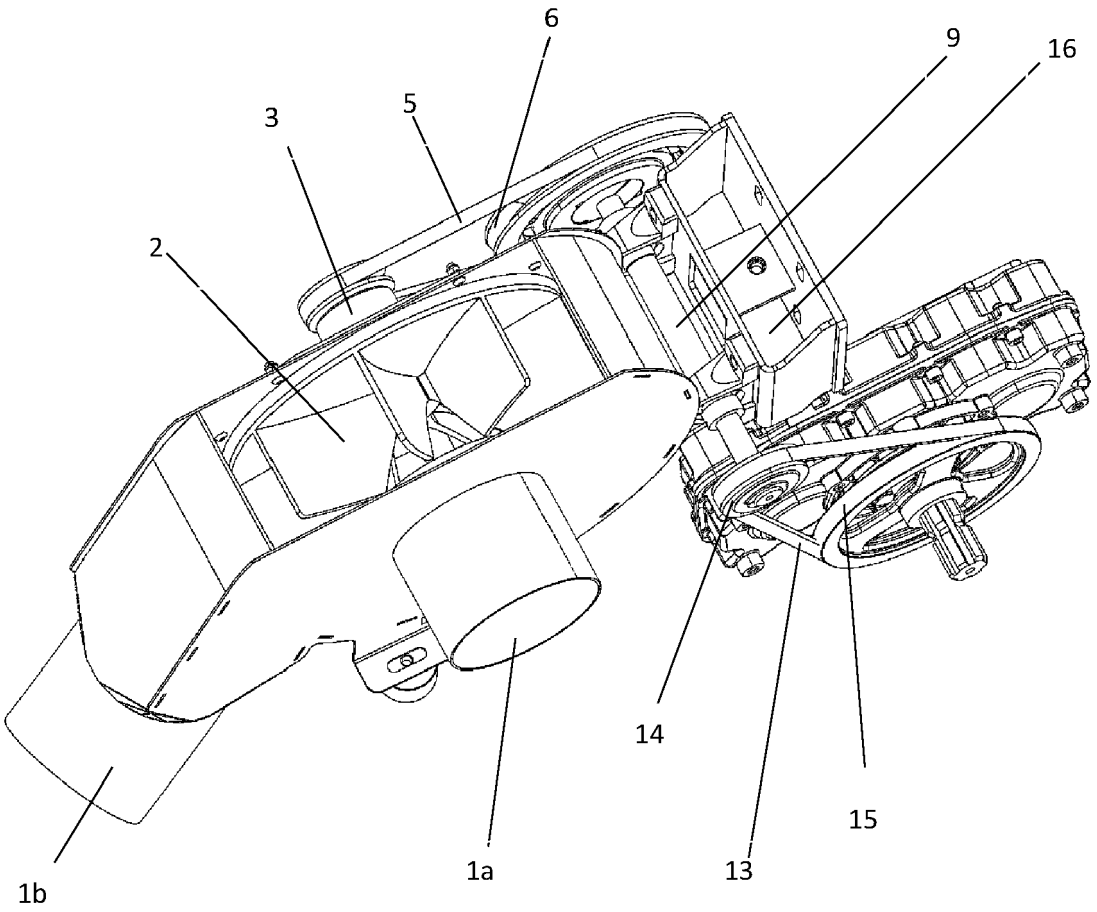

Figure 2c

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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 2375

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 345 416 A (CAMERON GEORGE R) 24 August 1982 (1982-08-24)	1,5	INV. B23D59/00
Y	* column 1, lines 6-9 * * column 2, lines 50-60 * * column 4, lines 27-31 * * column 4, line 57 - column 5, line 18 * * column 6, line 57 - column 7, line 13 * * figures 1,2 *	2-4,6-9	B27B5/10
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A	* column 1, lines 4-7 * * column 2, lines 6-8,40-47 * * column 3, lines 32-39 * * figures *	2-4,6-9	
Y	GB 2 167 633 A (PRIGG MICHAEL GEORGE) 4 June 1986 (1986-06-04)	2-4,6-9	
A	* page 1, lines 5-22,84-104 * * figure 2 *	1	

TECHNICAL FIELDS SEARCHED (IPC)
B23D
B27B
B23Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 April 2023	Chariot, David

CATEGORY OF CITED DOCUMENTS

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05-04-2023

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 1878526 A **[0005]**
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