

EXHAUST



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The invention relates to an exhaust with a housing, in which a working space is located which is open on one side.

Exhausts of this type are generally known and can be obtained on the market. They are subject to certain standards concerning a possible escape of harmful substances.

In this regard, it is known from DE 19712975 A1 to increase the blow-out safety of exhausts by means of air curtains, which are blown upwards at right angles to the opening of the working space, in particular from the lower side. Although it is thus possible to improve the blow-out safety against disturbances from the exterior, it is not however possible to prevent heavy gases, for example, from accumulating at the bottom of the working space or light gases from accumulating above the opening of the working space.

The problem underlying the invention consists in the fact that an exhaust of the type mentioned at the outset is designed in such a way that an accumulation of harmful substances at the side walls and the bottom of the working space in the housing is avoided.

This problem is solved according to the invention by devices arranged at the open side of the working space, which emit fresh air jets into the housing interior at an acute angle to the internal surface of the housing side walls and the housing bottom surface.

Particularly preferred developments and configurations of the exhaust according to the invention are the subject-matter of claims 2 to 14.

A particularly preferred example of embodiment of the invention is described in greater detail below with the aid of the respective drawing. The figures show the following:

Fig. 1 a longitudinal sectional view of the example of embodiment,



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Fig. 2 a cross-sectional view of the example of embodiment shown in fig. 1 through line A-A,

Fig. 3 a side view of the leading edge profile of the example of embodiment,

Fig. 4 a side view of a side post profile of the example of embodiment,

Fig. 5 the supply air device of the example of embodiment in detail and

Fig. 6 the effect of the design according to the invention in terms of reducing the risk of a blow-out of harmful substances.

The exhaust shown in fig 1 comprises a housing 1 with a bottom or a table plate 2, which encloses working space 3 of the exhaust on all sides, except for an opening closable by a sliding window 9. A baffle wall 4 runs across the rear wall of the exhaust in working space 3. Openings 5a, b, c and d are provided between baffle wall 4 and the housing walls and the chamber located behind baffle wall 4 is exhausted via a collecting channel 6, which is connected to an exhaust air system 7.

The side posts of housing 1 of the exhaust are designed as aluminium posts 8 formed for flow-technology purposes, preferably as a profiled part in the manner of an aircraft wing with a leading face pointing forwards, whereby sliding window 9 has an inflow profiled part 10 correspondingly formed for flow-technology purposes. The leading edge of table plate 2 also consists of an inflow profile 11 formed for flow-technology purposes, which can similarly be a profiled part in the manner of an aircraft wing with a leading face pointing forwards.

Above the exhaust there is arranged a supply-air pipe 12, from which supply air is blown into the exhaust, i.e. into working space 3. This supply air can originate from the external space or from an owner air-supply network. The amounts of air blown in, regulated by a regulator 13 which comprises a differential-pressure or flow sensor, a regulating butterfly valve, a motor and a central

electronic control unit, are blown into a distribution collecting channel 14 and introduced into working space 3 through a supply air nozzle 15, which consists of a chamber which is bounded by surface parts 16 and 16a. In the lower area of the chamber, which is formed in the manner of a nozzle, there are deflection profiles 17, which guide a free jet 18 inwards into working space 3 of the exhaust. The design of the supply air device is described below in detail with the aid of fig. 5.

As is further shown in fig. 1, inflow profile 11 at the leading edge of table plate 2 is designed in such a way that on both sides an air jet 22 is blown into the housing interior obliquely at an acute angle to the bottom surface in such a way that this air jet 22 is deflected by the inflowing air onto the table plate and passes along the table plate up to opening 5b between baffle wall 4 and the rear side of the exhaust.

The profiled parts of side posts 8 are also designed in such a way that they emit supporting jets 21 into the housing interior, which are also blown at an acute angle to the internal surfaces of the side walls of the housing.

Fig. 2, which shows a sectional view of the exhaust along line A-A in fig. 1, shows the course of air jets 21, 22 in detail. This means that, from the profiled part which forms side posts 8, air jets 22 emerge at an acute angle to the internal surfaces of the side walls, which air jets are deflected against the side walls due to the afterflowing air and go into exhaust openings 5d and 5e. A supply-air curtain formed from a plurality of air jets 21 additionally flows from leading edge profile 11 via table plate 2.

Fig. 3 shows table plate 2 and inflow profile 11 at its leading edge in detail. In the example of embodiment shown, profiled part 11 is designed as a hollow section and air flows via an air connection 24 into profiled part 11. This air escapes through millings 23, for example in the form of slots or nozzles, in such a way that an air jet 11

blown into the interior of the exhaust at an acute angle arises, which fits against the surface of table plate 2.

Fig. 4 accordingly shows a profile of side posts 8, which is also designed as a hollow chamber section. Air, which flows at an acute angle into working space 3 of the exhaust via an opening or nozzle 26, then fits against the internal surface of side part 27.

The devices for generating the additional air jets 21, 22 can be provided at a distance from the profile leading face or directly behind the profile leading face of profiled parts 8, 11.

Fig. 5 shows the upper area of the exhaust and here in particular the air supply device. As is shown in fig. 5, the air supply comes via an air supply fan or another fan, is split up by a pressure chamber 28 and is blown into working space 3 of the exhaust as free jet 18 via a nozzle, which comprises the housing sides and the two parts 16 and 16a of the chamber already mentioned.

In the lower area of this chamber, i.e. in the lower area of parts 16 and 16a, deflection profiles 17 are provided, which are designed such that the free jet from the nozzle is first bent and then deflected inwards, so that, together with the impetus of the air flowing in from the exterior, it flows inwards into working space 3 of the exhaust at an angle of 45° to the vertical. This supply air unites with the air flowing in from the exterior into working space 3.

Fig. 6 shows the effect of air jets 22 in detail. The same also applies to air jets 21.

Fig. 6a shows that inflowing air 30 fits against the inflow profile at the leading edge of table plate 2 but does not approach the table plate surface, so that a backflow zone 31 arises, into which air from the interior of working space 3 of the exhaust flows up to the breakaway edge and in which harmful substances are thus able to accumulate.

As is shown in fig. 6b, due to the force of air 30 flowing into the exhaust, additional air jet 22 fits directly against the surface of table plate 2 until it disappears in openings 5d and 5e.

When blowing-out of the air jets at the table plate and at the two sides is switched on, wall friction can thus be largely eliminated, so that the air flows inwards over the whole area of working space 3 and disappears behind baffle wall 4.

Particularly when working with heavy gases, this design has the advantage that the latter sink to the surface of the table plate and disappear directly at lower extraction opening 5b of working space 3 via the flow portion directed backwards.

Fresh air also flows around the area of the profile of sliding window 9 due to the inflow of additional air as free jet 18 in the upper area of the exhaust at deflection part 17, so that air cannot escape at the upper edge of sliding window 9 either.

The combination of free jet 18 and wall and bottom jets 21, 22 respectively thus generates an ideal flow configuration in the exhaust.

Possible ratings of the two side air jets 22 are such that the latter amount to around 15 to 20 m³/h. Lower air jet 21 has an air quantity of 10 m³/h per running metre. The air speed amounts to 2 m per second. The deflection angle of air jets 21, 22 is preferably around 20°, so that the latter flow to the internal surfaces in working space 3 at an acute angle. Upper free jet 18 at deflection profile 17 is not directed onto a wall, but is blown in the form of a free jet ahead of the space. It therefore requires a much higher air quantity of approx. 100 to 150 m³/h per running metre of exhaust width. An exhaust with a width of 1500 mm can therefore manage with a free jet of 150 m³/h and wall jets of approx. 50 to 60 m³/h.

Since such an exhaust can be operated with an air control, it requires 150 m³/h when the sliding window is

closed. Preferably, the design is such that, when the sliding window is open, the exhaust sucks out $900 \text{ m}^3/\text{h}$ and all wall and supporting jets are generated.

When sliding window 9 is closed, free jet 18 at deflection profile 17 is switched off, so that the exhaust can be lowered to approx. $150 \text{ m}^3/\text{h}$ air requirement when the sliding window is closed. It is therefore recommendable to operate the exhaust with a control which measures the position of vertical sliding window 9. If vertical sliding window 9 opens by more than 50 %, free jet 18 on deflection profile 17 is switched on. The same also applies when the horizontal sliding window of the exhaust is opened by more than 10 to 20 mm. Otherwise, free jet 18 is switched off.

In the case of an exhaust in the night-time operation, wall jets 21, 22 can also be switched off, so that the exhaust can always be operated with a small air quantity depending on the requirement situation, which represents a significant advantage compared with a conventional curtain exhaust. The exhaust air quantity then amounts to $100 \text{ m}^3/\text{h}$.

Since the supporting jets have a considerable influence on the function of the exhaust, they must be constantly checked and monitored in the course of the necessary monitoring of the function of the exhaust from the air-engineering standpoint. This monitoring can be carried out with a differential pressure sensor in the overpressure area where blowing-in takes place. An alarm occurs in the event of a malfunction.

The example of embodiment of the exhaust according to the invention described above displays a high stability compared with a side or oblique flow, in that a dead-space area is prevented at the exhaust surfaces or at the exhaust slide gates. Furthermore, provision is made for very good extraction of heavy gases, since the latter sink to table plate 2 and are blown by additional air jet 22 into opening 5b. If light gases are being worked with in the exhaust, free jet 18 at deflection profile 17 ensures that light gases, which form in working space 3 at the top above this

supporting jet 18, are reliably contained in the upper area of the exhaust and cannot contaminate the lower working area.

The design according to the invention, in which additional air jets 21, 22, 18 are generated, can be linked to the exhaust control in such a way that the exhaust can be operated with as small an air quantity as possible.

CLAIMS

1. An exhaust with a housing, in which a working space is located which is open on one side, characterised by devices arranged on the open side which emit air jets into the housing interior at an acute angle to the internal surfaces of the housing side walls and the housing bottom.
2. The exhaust according to claim 1, characterised in that the side posts and the leading edge of the working space at the open side are designed as flow-profiled parts with a leading face pointing forwards and the devices which generate the air jets are provided at the profiled parts.
3. The exhaust according to claim 2, characterised in that the profiled parts are designed as hollow sections, the internal space of which is connected to an air supply and in which there are openings from which the air jets can emerge.
4. The exhaust according to claim 3, characterised in that the exit angle to the internal surface of the housing is approx. 20°.
5. The exhaust according to claim 3 or 4, characterised in that the openings are designed as nozzles.
6. The exhaust according to claim 3 or 4, characterised in that the openings are designed as a slot.
7. The exhaust according to any one of the preceding claims, characterised in that a vertical sliding window is provided on the open side and a free-jet device is provided which generates a free jet which is

directed by a deflection profile into the interior of the working space.

8. The exhaust according to claim 6, characterised in that a flow profile is formed at the lower edge of the sliding window.
9. The exhaust according to claim 6, characterised in that the free jet can be switched on and off depending on the position of the sliding window.
10. The exhaust according to any one of the preceding claims, characterised in that the air jets are generated by a common fan in an air quantity of 10 to 15 m³/h.
11. The exhaust according to any one of the preceding claims, characterised by a baffle wall which runs in front of the rear wall of the exhaust in the working space and is designed such that the air jets, which go along the internal wall surfaces and the bottom surface, are sucked in directly between the baffle wall and the surrounding housing wall.
12. The exhaust according to claim 6, characterised in that the free jet is formed from air from an air-supply network or from air from a fan from the surrounding space.
13. The exhaust according to any one of the preceding claims, characterised by an air control which includes all the air jets.
14. The exhaust according to any one of the preceding claims, characterised by a monitoring device which monitors the blowing-in of the supply air by the air jets.