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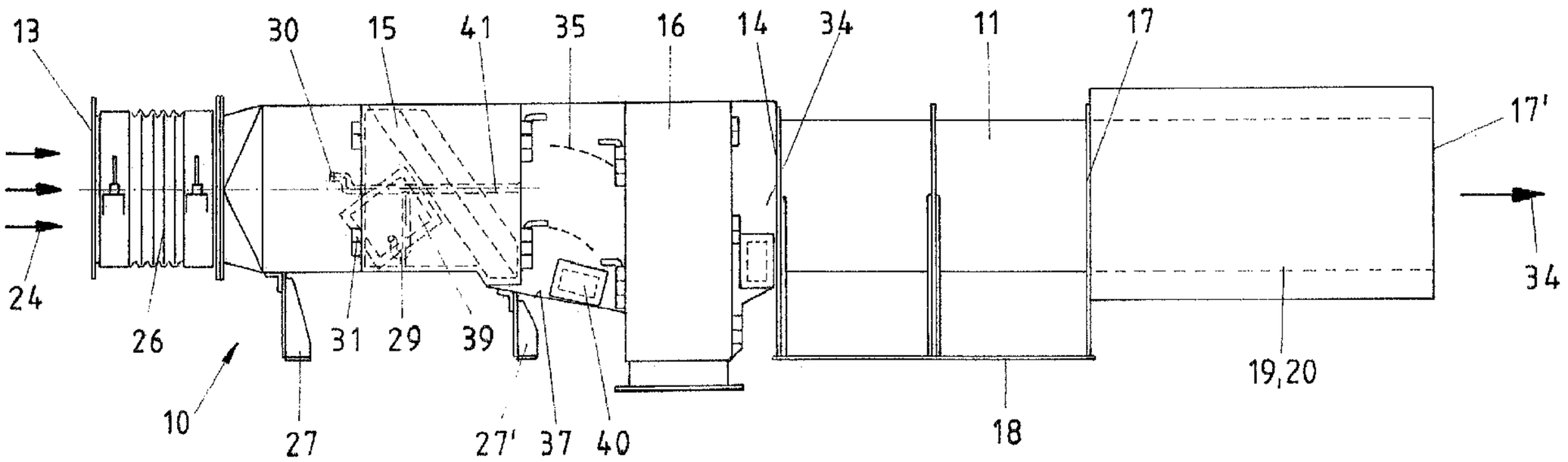

(57) **Abrégé/Abstract**:
A dust catcher 1 with a demister 15 that is preferably arranged so as to be inclined is of very compact construction because adequate moistening or wetting of the untreated air 24 that contains dust is made possible by the use of multijet nozzles that operate intensively. The fan 11 is associated with a dedicated fan housing 18 that is connected to the dust-catcher housing 10, and is followed by a muffler 20.

27026-58

ABSTRACT

A dust catcher 1 with a demister 15 that is preferably arranged so as to be inclined is of very compact construction because adequate moistening or wetting of the untreated air 24 that contains dust is made possible by the use of multijet nozzles that operate intensively. The fan 11 is associated with a dedicated fan housing 18 that is connected to the dust-catcher housing 10, and is followed by a muffler 20.

Figure 2 is provided for disclosure.

Dust Catcher

The present invention relates to a dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunnelling operations, with a dust-collector housing that has as the separator element a demister that is equipped with wetting nozzles and a mist collector, and which has a fan and fan-drive system that are connected on the intake/output side.

Such a dust catcher is known from DE 198 53 190 A1. This known dust catcher incorporates a fan that is disposed between the input and the ouput side, in the flow of untreated air, which is to say upstream from the demister and the mist collector. Wetting nozzles are not only associated with or arranged upstream from the demister, which is disposed so as to be suspended almost horizontally in the flow of air; the fan wheel is also arranged in the same way, so that it is encumbered not only by dust, but also by water droplets. Additional wetting nozzles are disposed in the area of the gearing system, so that dust that has already been wetted arrives in the area of the demister. The nozzles that are arranged there discharge in the direction of the demister so as to facilitate separation of the sludge in the demister. Apart from the numerous upstream wetting or water nozzles, it is a disadvantage that they do not provide for a uniform water mist that results in the dust that is being carried by the air being wetted. It is an additional disadvantage that the arrangement described heretofore does not permit compact construction of the dust catcher, but only an extended layout.

For this reason, it is the objective of the present invention to create a dust catcher that generates extremely fine, optimally effective water droplets, even in the case of intermittently severe dust conditions.

According to the present invention, this objective has been achieved in that the wetting nozzles that are disposed upstream from the demister in the direction of the air flow are configured as multijet nozzles, the individual nozzles of which are arranged so as to create a combined spray pattern; and in that the fan is positioned in the flow of clean air, downstream from the demister and the mist collector.

Given a dust catcher that is configured in this way, it is—most surprisingly—possible the make the overall dust-catcher housing very compact, with the fan or fan housing being "detached." Because of the intensive wetting of the dust by the multijet nozzles there is no need to arrange nozzles that produce water mist upstream, so that the fan can be positioned after the demister and the mist collector, since it is no longer required to provide uniform wetting of the untreated gas or the untreated air. This entails the other major advantage that the fan wheel as such is not encumbered by water droplets, by dust particles, or by sludge. Rather, it is accommodated in "safe" space after the demister and the mist collector. Since a plurality of multijet nozzles are provided, each of which generates a common spray pattern, it is possible to generate a screen of extremely fine water mist through which the dust particles can pass only when appropriately wetted. They are then trapped in the demister and removed, whilst any water droplets still remaining are trapped in the mist collector and similarly disposed of. Thus, only clean air that cannot damage it reaches the area of the fan and, in particular, the fan wheel. Because its installed size has been reduced, a dust catcher of this kind is extremely

versatile, quite apart from the fact that it operates much more efficiently because of its particular configuration and that the associated production costs are more favourable.

One practical embodiment of the present invention is such that the fan is associated with a fan housing that can be coupled to the dust-catcher housing, and is provided with a noise abatement system. Because of the special configuration of the dust catcher, it is now possible for the fan to have its own housing and thus its own noise-abatement system. This means that the fan housing as such contains the noise-abatement system, so that the noise emitted by a dust catcher of this kind is greatly reduced. A corresponding noise-abatement system could not be associated with an older-type fan integrated into the dust-catcher housing because of its installed size. A dust catcher according to the present invention satisfies environmental regulations that are becoming ever more stringent.

According to another development, a muffler that serves as a noise abatement system is associated with the fan housing or preferably disposed downstream it. If an appropriate noise-abatement system is associated with it directly, an appropriate increase in the thickness of the walls of the fan housing will ensure the desired noise abatement, whereas positioning a muffler downstream minimizes the exit noise generated by the clean air or the noise emitted by the fan.

It has already been stated that because of the favourable installed size of an appropriately combined dust catcher it is possible to combine it directly with dust generators.

According to the present invention, provision is thus made such that the dust catcher and the fan housing are installed on a tunnelling machine when coupled together, preferably

in the area between the cutter-head arm and the conveyor. With such an arrangement, the dust catcher can be so positioned that it draws in and removes the dust generated by the cutting head directly, so that there is absolutely no danger that some of the flow of air bypasses the dust catcher and moves into the working area or a corresponding space. The type of arrangement that has been described is a type of saddle mounting on the tunnelling machine, so that there is no requirement for additional installation space; on the contrary, the compact dust catcher and fan housing can be integrated very simply into existing space.

In order to prevent excessively large dust particles or even stones from getting into the demister, and thereby protect the demister from becoming damaged, the present invention provides that the demister is arranged at an angle in the untreated air, directly at the intake, the upper edge being configured and arranged so as to project beyond the lower edge. The upper edge thus serves to protect the following demister, so that there is no need for additional, special protection. Rock or dust falling from the roof are not carried along by the flow of air, but can fall through this and accumulate on the floor.

In order to make them independent of the movement of the cutter-head arm and the conveyor, the dust-catcher and fan housing have their own dedicated supports, on which they are installed on the tunnelling-machine running gear. The two housings are thus connected directly to the running gear and so stay in position regardless of the position of the cutter-head arm and, in particular, the position of the conveyor.

If the dust catcher and the fan housing are positioned as described above, the clean air is discharged above the conveyor. In order to prevent the generation of new dust when this

is done, the invention provides that the intake side of the dust-catcher housing or the fan housing incorporate a deflector nozzle. This deflector nozzle ensures that the clean air is deflected in such a manner that it cannot disturb the material on the conveyor. This deflector nozzle is adjustable so that the direction of the emerging clean air can be adjusted as required.

According to the present invention, uniform loading of the demister and the mist collector by dust or with wetted air have been achieved in that air baffles are arranged between the demister and the mist collector and that bottom plates are positioned so as to be inclined in the direction of the mist collector. The water-dust mixture or the sludge is guided over the inclined bottom plates towards the mist collector so as to be discharged with the waste water, or separated, as desired. The sludge is then routed to a settling tank or disposed of in some other way, so that the demister and the mist collector can be reached uniformly by the appropriate air flows.

It has been stated heretofore that the multijet nozzles, as used according to the present invention, cause the incoming dust to be thoroughly wetted. This is achieved, in particular, in that the multijet nozzles are arranged so as to discharge against the untreated air, which is to say that they generate a very intensive and dense water mist made up of extremely fine droplets, so that rapid and reliable adsorption on the incoming dust. The dust can then be trapped in the demister and disposed of as described above.

According to the present invention, the uniform and dense mist, as seen above the access surface of the demister, is achieved in that the multijet nozzles are arranged in a supporting framework that is inclined so as to correspond to the inclination of the

demister. The multijet nozzles spray their water into the untreated air, whereby a uniformly thick water mist is achieved for the total surface of the demister by the arrangement that has been described, independently of whether or not the untreated air is flowing along the upper, ceiling area of the demister, through its middle area, or along its bottom.

In order to permit easy and rapid monitoring of the state of the demister and the mist collector, and at the same time make a replacement or perform other work in this area, inspection doors are provided in the dust-catcher housing, in the area of the demister and of the mist collector. It is preferred that these doors be revolving doors. The use of revolving doors ensures that these components are immediately available again once the inspections have been completed, and that these doors are precisely seated, as is required for them to be effective. The inspection doors must be fitted with seals that are always correctly seated and provide an effective seal.

The multijet nozzles that are used have a plurality of individual nozzles that—according to the present invention—are supplied uniformly with pressurized water because the individual multijet nozzles have a common distributor chamber to which the individual nozzles, which spray into one another and are arranged so as to be evenly distributed, are connected. All of the individual nozzles are thus acted upon by equal pressure since they are all supplied with pressurized water from one and the same distributor chamber. They are arranged so as to spray in overlapping patterns in order to generate the uniform combined spray pattern that is essential for ensuring that the dust is uniformly wetted.

One development that ensures generation of a uniform spray pattern is such that the individual nozzles of a multijet nozzle are of identical diameter and have outlet bores that are of identical diameter. They are arranged at a set distance from one another so that they produce a uniform spray pattern, and so that because of the equal pressure and the same dimensions it is ensured that they do not interfere with each other and that a uniform spray pattern is produced or predetermined.

If a specifically enlarged spray angle is to be generated, it is an advantage if some of the individual nozzles be arranged so as to discharge from an inclined area of the nozzle base surface, whilst one or several of the individual nozzles remain assigned to a plane of the nozzle base surface. In this way, it is possible to generate a greater spray angle that nevertheless provides the required intensity or the required spray pattern.

A uniform spray pattern that causes the dust to be precipitated is to be generated by the multijet nozzles when, according to the present invention, the multijet nozzles with the smaller spray angle (e.g., 60°) and the multijet nozzles with the greater spray angle (e.g., 120°) on the supporting framework generate a full-circle spray pattern. It is, for example, possible that the multijet nozzles with the smaller spray angle be positioned on the outer edge, and one or more multijet nozzles with a greater spray angle be positioned on the supporting framework so as to ensure the most intensive possible wetting or effect on the dust that is carried along by the untreated air.

Because of one useful development of the present invention, it is possible to tackle the problem of the fumes produced by explosions by using a largely identical dust-catcher system. To this end, provision is made such that the wetting nozzles are arranged

upstream from the demister in the direction of the airflow; in that the fan is positioned in the flow of clean air, downstream from the demister and the mist collector; and in that additive containers that are arranged and configured so as to discharge into the water pipe by way of a metering device. This makes it possible to use identical equipment, which is to say with the same dust-catcher housing, to so process and manage the explosion fumes that are liberated during blasting operations that the gases or the corresponding air that are present in the flow of clean air have no properties that can cause environmental damage. It is not possible to ensure with any certainty that no unpleasant odours will be caused by the compounds that are formed; however, these can be dealt with separately, or even accepted, since that cannot harm humans. In this solution, the wetting nozzles are so arranged that they act intensively on the flow of air, and thus process it, in order to precipitate the dust or act on the explosion fumes so that the droplets can be removed from the air in the demister that follows, so that they can be processed separately or introduced into the flow of clean gas in the form of air. The quantities of additives that is necessary and practical for the composition of the explosion fumes is removed from the additive containers by way of the appropriate metering device.

According to one useful development, provision is made such that the metering device is followed by a mixer that is either associated with the water pipe or integrated into this, so that the additives that are added are thoroughly mixed with the water before it is mixed with the explosion fumes by way of the wetting nozzles. It is, of course, to be understood that the metering device and the mixer that follows it have to be actuated separately in order to prevent these additives being added when the dust is being

precipitated. However, it is also possible to provide additional additives such as ones that facilitate precipitation of the dust.

Finally, as developed, the present invention provides that a spray system be incorporated upstream, either during simultaneous utilization of the usual wetting nozzles or separately from the wetting nozzles and the demister with the mist collector, this spray system having nozzles that generate very finely dispersed droplets and being connected with a water supply or the water feed pipe and to the metering device with the mixer. Depending on the type of explosion fumes or their particular composition, it can be most practical to perform this preparation and processing of the explosion fumes in two steps; namely once by way of the usual wetting nozzles and once by way of the nozzles that are positioned upstream from the wetting nozzles, when it is then possible to adjust or select these upstream nozzles to produce particularly fine water droplets without even being able to mix and treat the explosion fumes intensively. In addition, as taught by the Claims, it is possible to use only these nozzles that are upstream of the wetting nozzles if what is required is to clean the explosion fumes, and not actuate the downstream wetting nozzles during this step of the process.

It is known that during the operation of machinery and plant in underground mining operations, the dust that is generated can be precipitated by spraying it with water, thereby improving the air. The fumes that are caused by shot firing, which is to say by explosions, have up to now been drawn in by air-duct systems and then disposed of; this is usually done without affecting the explosion fumes and the nitrous gases they contain in any form. The explosion fumes are routed into the return air flow and then mixed with this so that they are no longer hazardous, because of the degree of reduction that

takes place because of the mixing. However, the latest regulations make it illegal to discharge untreated nitrous gases to the atmosphere. For this reason, a method according to the present invention is such that the fumes created by explosions are acted upon in alternation by the device that precipitates the dust with water that has been reduced to the finest droplets and to which additives have already been added; these additives combine with the nitrous and similar gases that are liberated by an explosion to form environmentally safe compounds. Thus, this method makes it possible to so precipitate and treat the injurious nitrous gases (NO) that they form compounds that are environmentally safe and which thus pose no danger to humans and machinery. Any odour nuisance will have to be combated by suitable measures, although as a rule such odours as are generated are insignificant. It is also an advantage that no separate system is required for this way of treating explosion fumes and rendering them harmless; rather, one can resort to an appropriately supplemented dust catcher of the kind used in large numbers in underground mining operations, or can be appropriately modified so that it can perform this double function.

Finally, the present invention is such that water that has been enriched with additives is combined intensively with the explosion fumes at some distance ahead of the device that precipitates the dust, and then sprayed on these, so that in this way either double cleansing is performed; namely in the upstream nozzles or in the normal nozzles that are used for precipitation, or only in the upstream nozzles. This results in a versatile method that can be effected as required, without any additional, major costs, and that ensures effective precipitation of the dust and nitrous gases and renders them harmless.

In particular, the present invention is characterized in that, because a complete-circle spray pattern that is made up of reliably produced, extremely fine droplets is generated upstream from the demister, it is possible to make the overall dust-catcher housing very compact and keep the fan separate; this is done, first, to protect it, and second, to make it possible to fit it with sound mufflers and thereby satisfy environmentalists to an even greater degree. The individual nozzles of the multijet nozzles are so arranged and distributed that a very intensive mist made up of extremely fine water droplets is formed ahead of the demister, and this renders the use of additional water jets upstream from the demister unnecessary. The wetted dust or sludge is precipitated within the demister and disposed of, whereas any droplets remaining in the clear air are trapped in the mist collector in order to be routed out of the flow of air for disposal. Viewed overall, because of this special configuration of the dust catcher, it can be associated directly with the machinery that generates the dust, for example, a tunnelling machine, in order to perform its task in a purposeful manner at the correct location; namely, to remove dust from the damp or from the air, in order to precipitate it and thereby comply with mining and other regulations. In addition to precipitating the dust, the same dust catcher, suitably modified, can be used to manage explosion fumes that are always generated in underground mining operations or tunnelling operations when driving the workings forward. As in the past, it is impossible to dispense with shot firing when rocky sections or seams are encountered because, for example, the cross section of the working face is too small. Of particular advantage with this type of dust catcher, or of a corresponding method, is that it is possible to manage without a special device and that the additional outlay required in such a case is relatively small, although the results can be extremely

27026-58

good. First, it is possible to precipitate the dust and render it harmless by using such a device; it is also possible to manage explosion fumes and do this in alteration.

According to one aspect of the present invention, there is provided a dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing that has as a separator element a demister that is equipped with wetting nozzles and a mist collector, and to which a fan and fan-drive system are associated on an intake/output side, characterized in that the wetting nozzles that are arranged upstream from the demister in the direction of the air flow are configured as multijet nozzles, the individual nozzles of which are arranged so as to produce a combined spray pattern; and in that the fan is positioned in the flow of clean gas downstream from the demister and the mist collector.

According to another aspect of the present invention, there is provided a dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing that has, as a separator element, a demister that is equipped with wetting nozzles and a mist collector, and to which a fan and fan-drive system are associated on the intake/output side, characterized in that the wetting nozzles are arranged upstream from the demister in the direction of the air flow; in that the fan is positioned in the flow of clean air, downstream from the demister and the mist collector; and in that additive containers are provided, these containers being configured and arranged so as to discharge into a water feed pipe through a metering device.

According to still another aspect of the present invention, there is provided a dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing that has as the separator element a demister that is equipped with wetting nozzles and a mist collector, and to which a fan and fan-drive system are associated on the intake/output side, characterized in that a spray device is disposed

upstream from the wetting nozzles and the demister with the mist collector, said spray device having nozzles that generate finely dispersed droplets, and being connected to a water supply or the water-feed pipe and the metering device with the mixer.

According to yet another aspect of the present invention, there is provided a method for precipitating dust behind machinery and plant that generates dust during underground mining and tunneling operations, and for disposing of explosion fumes with gases contained therein, on site, air that contains the dust being acted upon by water that has been reduced to extremely fine droplets, resulting sludge being collected and the moist air being dried by the water droplets being separated out, and then routed to the flow of clean air, characterized in that fumes that are created by shot-blasting operations are acted upon in the device that precipitates the dust by water that has been reduced to very fine droplets and in which have been mixed additives that combine with the nitrous gases liberated by an explosion to form environmentally benign compounds.

Additional details and advantages of the present invention of the object of the present invention are described below on the basis of the drawings appended hereto. These drawings show the following:

Figure 1: A diagrammatic view of a tunneling machine with a dust catcher;

Figure 2: A side view of a dust catcher with a separate fan housing;

Figure 3: A plan view of the dust catcher shown in Figure 2;

Figure 4: An additional version of a dust catcher with a separate fan housing, as viewed from the side;

Figure 5: The dust catcher shown in Figure 4, as viewed from the side;

Figure 6: A supporting framework with a plurality of multijet nozzles;

27026-58

Figure 7: A cross section through a multijet nozzle with an inclined surface;

Figure 8: A multijet nozzle in partial cross section, with a flat arrangement of the individual nozzles.

Figure 1 shows a side view of a tunneling machine 2 with an integrated dust catcher 1. The tunneling machine 2 is positioned in a section 3 (which is only indicated herein) of underground workings, and has the cutter-head arm 4 with the extraction cutter 8 and, downstream from this, a conveyor 5. The dust catcher 1 is associated directly with the

tunnelling machine 2 and is connected to the running gear 7 through a supporting column 6. It thus rests on the running gear 7 so that the position of the cutter-head arm 4 and of the conveyor do not affect its location.

It can be seen from Figure 1 that the fan 11 with its drive system 12 is not disposed between the intake side 13 and the outlet side 14 of the dust-catcher housing, but rather on the far side of the demister 14 and of the mist collector 16, within a dedicated fan housing 18. The fan housing 18 incorporates a noise abatement system 19 in the form of a muffler 20, so that the clean air emerging in the area of the outlet 17 of the fan housing 18 generates very little noise.

At the outlet 17 of the fan housing 18 there is a deflector nozzle 21 that ensures that the emerging clean air does not disrupt downstream operations. The deflector nozzle can be adjusted as desired, in order to direct the clean air towards the roof ridge or another area of the workings.

Figure 1 also shows that the dust-catcher housing 10 is of a special shape in the area of the demister 15, since the upper edge 22 extends for some distance beyond the lower edge 23. This means that rocks and coarse dust are unable to get into the area of the demister 15.

The untreated air is numbered 24, and the flow of clean air is numbered 34. Both points indicate the direction of flow of air 25.

Figure 2 is a plan view of a dust catcher 1, the untreated air being numbered 24; this untreated air flows from the air trunk 26 into the dust-catcher housing 10. It is in this

area that it comes into contact with the water mist that is generated by the wetting nozzles 29, 30, 31 in the form of the multijet nozzles 33. These multijet nozzles 33 discharge into the untreated air and thus provide for intensive wetting of the dust that is carried in, and ensure contact between the water and the dust. The dust is then separated out in the demister 15, whereas the air that is still carrying water droplets is then distributed uniformly on the mist collector 16 by the air baffles 35, 36. It can be seen that the bottom plate 37 is so inclined that the sludge is either removed and moved into the area of the mist collector 16 or can be removed, for example, through the inspection door 40. The whole dust-collector housing 19 is supported on the bottom by the supports 27, with the downstream fan housing also being supported, or having its own dedicated supports.

The multijet nozzles referred to heretofore are disposed in a supporting framework 38 in order to ensure equal water mist for the downstream, inclined demister 15. The water feed line is numbered 41, and this supplies these individual multijet nozzles 33 uniformly with pressurized water.

There is an additional inspection door 39 in the area of the supporting framework 38, and it can be seen that all these inspection doors 39, 40 are hinged doors so that they always close in the same position.

In the area of the outlet side 14, a fan housing 18 is joined to the dust-catcher housing 10; the fan and its fan wheel operate within this housing, and ensure that the untreated air 24 is drawn through the dust-collector housing 10. The fan 11 itself comes into contact with only clean air, which is to say the flow of clean air numbered 34. This

leaves the fan housing 18 either through the outlet 17 or through the outlet 17'; namely, when the actual fan housing 18 is followed by a noise-abatement system in the form of a muffler.

Figure 3 is a plan view of a dust catcher 1 with the dust-catcher housing 10 and the downstream fan housing 18 with the muffler 20 that serves as a noise-abatement system 19. The dust-catcher housing 10, in which the demister 15, the mist collector 16, and the wetting nozzles 29, 30, 31 are arranged, is upstream from the fan housing 18. These wetting nozzles 29, 30, 31 are supplied from the water feed pipe 41, which is usually connected to the main water supply system. A mixer 62 is arranged in this water feed pipe 41; this is arranged in such a way that it mixes the liquid from the additive containers 58, 59, which is routed through the by-pass, with the water that is flowing in the water feed pipe 41. The correct quantity of additives is mixed in by the metering device 60, so that if explosion fumes are drawn in a water-additive mixture is sprayed onto these fumes through the wetting nozzles 29, 30, 31, thereby ensuring that the nitrous gases that accompany the explosion fumes are rendered harmless. It is, of course, to be understood that other additive containers can be provided in addition to the additive containers 58, 59; for example, containers that add an additive the water in the normal course of events, i.e., when the dust-catcher is operating, so as to facilitate the precipitation of the dust. As a rule, however, the mixer is only activated when explosion fumes have to be precipitated out after blasting operations.

If the explosion fumes are particularly intense, or for other reasons, it may can be useful to incorporate a spray device 64 upstream of the spray device and treatment device described heretofore. This spray device 64 with the nozzles 65, 66 is only indicated in

the drawings , and is located in the area of the air trunk connector 26. The distance between this spray device 64 and the wetting nozzles 29, 30, 31 can be selected as required. The necessary additives for this spray device 64 are also drawn off from the additive containers 58, 59 by way of the metering device 60, so as to ensure thorough mixing by the mixer 62, in particular when water from the water supply system 67 is to be mixed in.

It is also possible to use the spray device 64 and the normal wetting nozzles 29, 30, 31 together, or to use only the appropriately improved wetting nozzles 29, 30, 31, or only the spray device 64. This ensures optimal versatility.

Figures 4 and 5 show another possible configuration of the dust catcher 1; this consists of the dust-catcher housing 10 and the fan housing 18. Here, too, the demister 15 is positioned so as to be inclined at the inlet side 13 of the dust-catcher housing 10, where it is acted upon by the untreated gas or the untreated air 24. Before it reaches the demister 15, this untreated air 24 must pass through the water mist 42 generated by the multijet nozzles 33, 33', 33". When this takes place, the dust is intensively wetted so that it is precipitated in the demister 15 and then disposed of. In this case, too, there are inspection doors 39 through which the individual parts and areas of the dust-catcher housing can be accessed. The fan housing 18 with its fan 11 and the fan-drive system are located downstream from the dust-catcher housing 10. A muffler 20 is positioned downstream from the fan housing 18 and the fan 11, so as to reduce the noise nuisance that is generated.

Figure 6 illustrates the full-circle spray pattern 54 that comprises the individual spray patterns 52, 53 of the multijet nozzles 33. It can be seen that the spray patterns 52 or 53, 53' are not of equal size. This is so because the individual multijet nozzles 33 are constructed differently, as can be seen from Figure 7 and Figure 8. The individual multijet nozzles 33 are installed in a supporting framework 38 that is formed by the water feed pipes 41. This makes it possible to supply the multijet nozzles 3 with pressurized water in an optimal fashion and arrange them so that the combined spray pattern is created as shown.

The individual multijet nozzles 33 have a compact housing 44 that incorporates a distributor chamber 45 from which the individual nozzles 46, 47 can be uniformly supplied with pressurized water. According to Figure 8, the individual nozzles 46 are, for example, arranged in a circle, so that their outlet bores 49 are disposed at the same level away from the nozzle base surface 50. As can be seen in Figure 7, there is an inclined surface 48 through which some of the individual nozzles 46 discharge, whereas other individual nozzles 47, as in the embodiment shown in Figure 8, discharge from within the nozzle base surface 50. The embodiment shown in Figure 7 results in a correspondingly greater spray pattern 52, because the individual nozzles 47 discharge at a different angle and at another level. Despite this, the full-circle spray pattern 54 shown in Figure 6 provides optimal uniformity and intensity.

All of the features referred to, including those that can be seen in the drawings alone, are essential to the present invention, either singly or in combination.

27026-58

CLAIMS:

1. Dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing (10) that has as a separator element a demister (15) that is equipped with wetting nozzles (29, 30, 31) and a mist collector (16), and to which a fan (11) and fan-drive system (12) are associated on an intake (13)/output (14) side, characterized in that the wetting nozzles (29, 30, 31) that are arranged upstream from the demister (15) in the direction of the air flow are configured as multijet nozzles (33), the individual nozzles (45, 47) of which are arranged so as to produce a combined spray pattern; and in that the fan (11) is positioned in the flow of clean gas (34) downstream from the demister (14) and the mist collector (16).

2. Dust catcher as defined in claim 1, characterized in that the fan (11) is associated with a fan housing (18) that can be coupled to the dust-catcher housing (10) and with a noise-abatement system (19).

3. Dust catcher as defined in claim 2, characterized in that a muffler (20) that serves as a noise-abatement system (19) is associated with the fan housing (18), preferably downstream therefrom.

4. Dust catcher as defined in any one of claims 1 to 3, characterized in that the dust-catcher housing (10) and the fan housing (18) are arranged on a tunneling machine (2) coupled together, preferably in the area between the cutter-head arm (4) and the conveyor belt (5).

5. Dust catcher as defined in any one of claims 1 to 4, characterized in that the demister (15) is arranged so as to be inclined in untreated air (24), directly at an input side (13), an upper edge (22) thereof being embodied and arranged so as to project beyond a lower edge (23).

27026-58

6. Dust catcher as defined in any one of claims 1 to 5, characterized in that the dust-catcher housing (10) and a fan housing (18) have their own supports (6) on which they are supported on the running gear (7).

7. Dust catcher as defined in any one of claims 1 to 6, characterized in that an output side (14) of the dust-catcher housing (10) or the fan housing (18) has a deflector nozzle (21).

8. Dust catcher as defined in any one of claims 1 to 7, characterized in that, between the demister (15) and the mist collector (16), there are air baffles (35, 36) and a bottom plate (37) is inclined towards the mist collector (16).

9. Dust catcher as defined in any one of claims 1 to 8, characterized in that the multijet nozzles (33) are arranged so as to discharge against untreated air (24).

10. Dust catcher as defined in any one of claims 1 to 9, characterized in that the multijet nozzles (33) are associated with a supporting framework that is inclined so as to correspond to a slope of the demister (15).

11. Dust catcher as defined in any one of claims 1 to 10, characterized in that there are inspection doors (39, 40) on the dust-catcher housing, in the area of the demister (15) and of the mist collector (16).

12. Dust catcher as defined in any one of claims 1 to 11, characterized in that the individual multijet nozzle (33) has a compact housing (44) that is equipped with a distributor chamber (45) on which the individual nozzles, which spray into one another, are distributed.

13. Dust catcher as defined in any one of claims 1 to 12, characterized in that the individual nozzles (46, 47) of a multijet nozzle (33) are of identical diameter and have identical outlet bores.

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14. Dust catcher as defined in any one of claims 1 to 13 characterized in that in order to enlarge the angle of spray, some of the individual nozzles (46, 47) are arranged so as to discharge in the area of an inclined surface (48) of the nozzle base surface (50).

15. Dust catcher as defined in any one of claims 1 to 14, characterized in that the multijet nozzles (33) with a smaller spray angle (e.g., 60°) and the multijet nozzles with a larger spray angle (e.g., 120°) arranged on the supporting framework produce a completely circular spray pattern.

16. Dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing (10) that has, as a separator element, a demister (15) that is equipped with wetting nozzles (29, 30, 31) and a mist collector (16), and to which a fan (11) and fan-drive system (12) are associated on the intake (13)/output (14) side, characterized in that the wetting nozzles (29, 30, 31) are arranged upstream from the demister (15) in the direction (25) of the air flow; in that the fan (11) is positioned in the flow (34) of clean air, downstream from the demister (15) and the mist collector (16); and in that additive containers (58, 59) are provided, these containers being configured and arranged so as to discharge into a water feed pipe (41) through a metering device (60).

17. Dust catcher as defined in claim 16, characterized in that a mixer (62) is associated with or integrated into the water-feed pipe (51) and positioned downstream from the metering device (60).

18. Dust catcher for use behind or on machinery or plant that generates dust in the course of underground mining or tunneling operations, with a dust-collector housing (10) that has as the separator element a demister (15) that is equipped with wetting nozzles (29, 30, 31) and a mist collector (16), and to which a fan (11) and fan-drive system (12) are associated on the intake (13)/output (14) side, characterized in that a spray device (64) is disposed upstream from the wetting

nozzles (29, 30, 31) and the demister (15) with the mist collector (16), said spray device (64) having nozzles (65, 66) that generate finely dispersed droplets, and being connected to a water supply (67) or the water-feed pipe (41) and the metering device (60) with the mixer (62').

19. Method for precipitating dust behind machinery and plant that generates dust during underground mining and tunneling operations, and for disposing of explosion fumes with gases contained therein, on site, air that contains the dust being acted upon by water that has been reduced to extremely fine droplets, resulting sludge being collected and the moist air being dried by the water droplets being separated out, and then routed to the flow of clean air, characterized in that fumes that are created by shot-blasting operations are acted upon in the device that precipitates the dust by water that has been reduced to very fine droplets and in which have been mixed additives that combine with the nitrous gases liberated by an explosion to form environmentally benign compounds.

20. Method as defined in claim 19, characterized in that water that has been enriched with additives is brought into intimate contact with explosion fumes upstream from a device that precipitates the dust, and then sprayed onto said fumes.

Fig.1

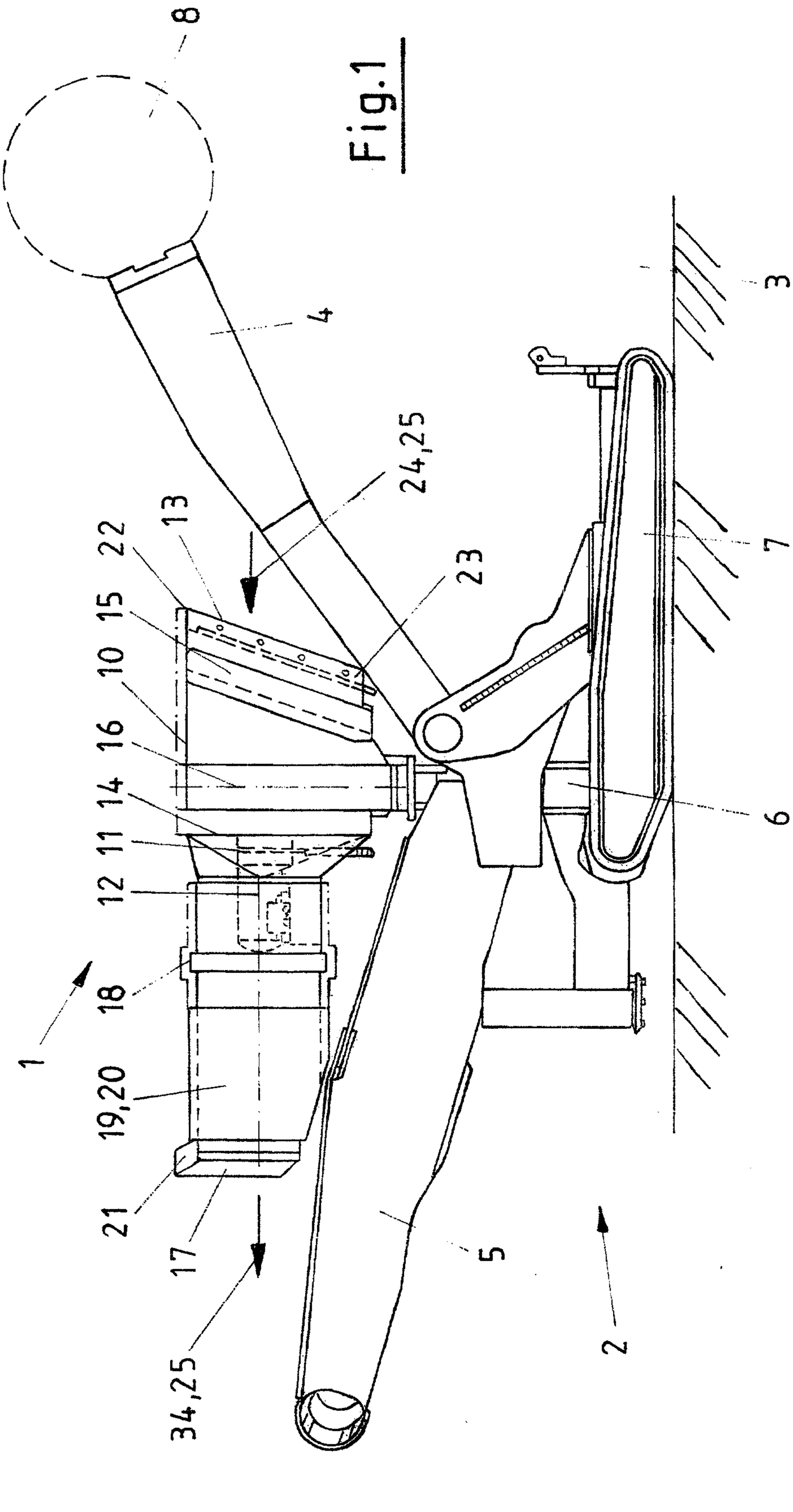

Fig.2

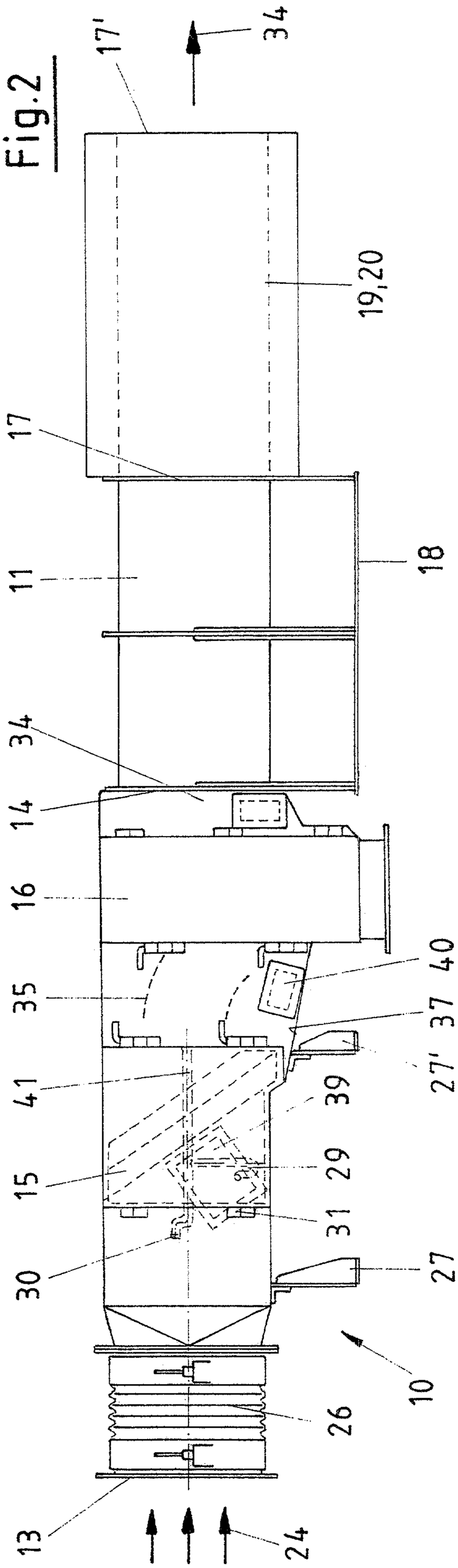
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Fig.3

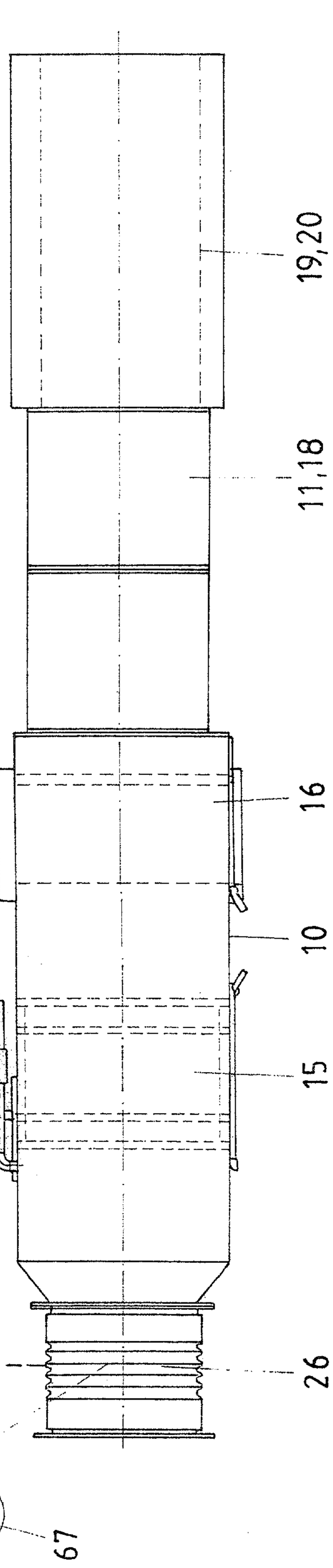
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Fig.4

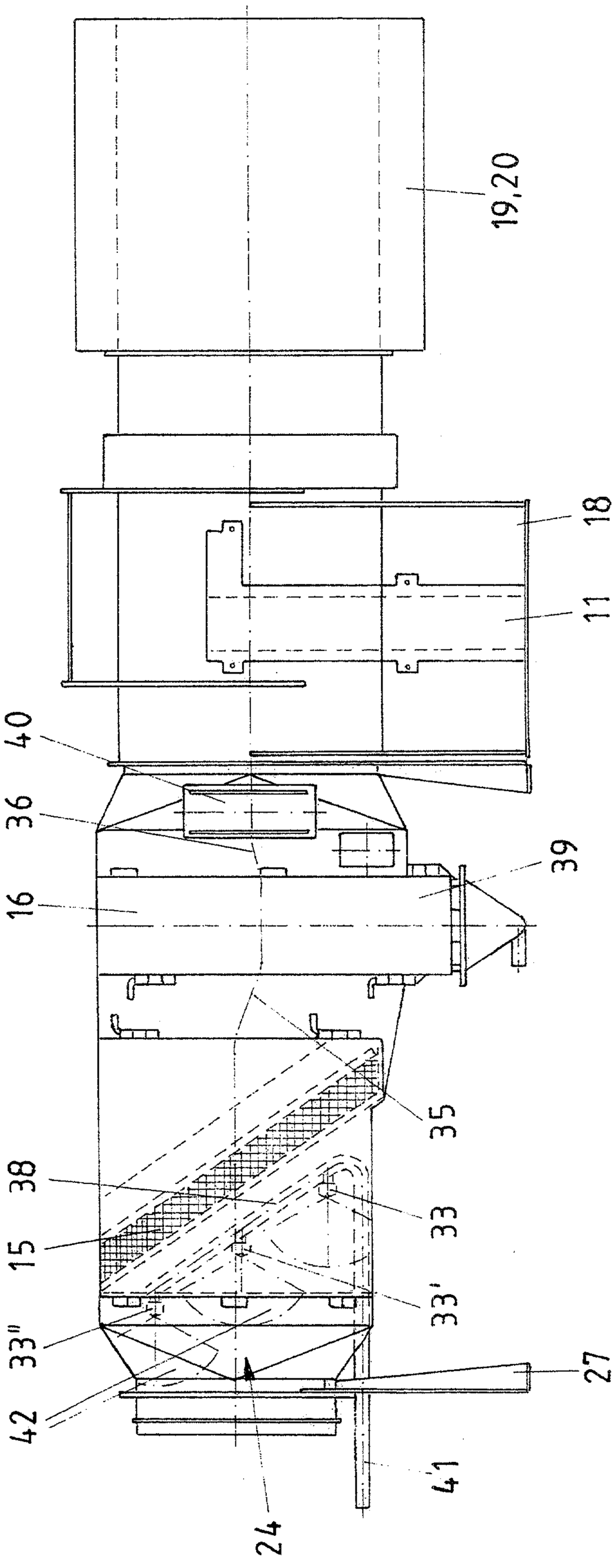


Fig.5

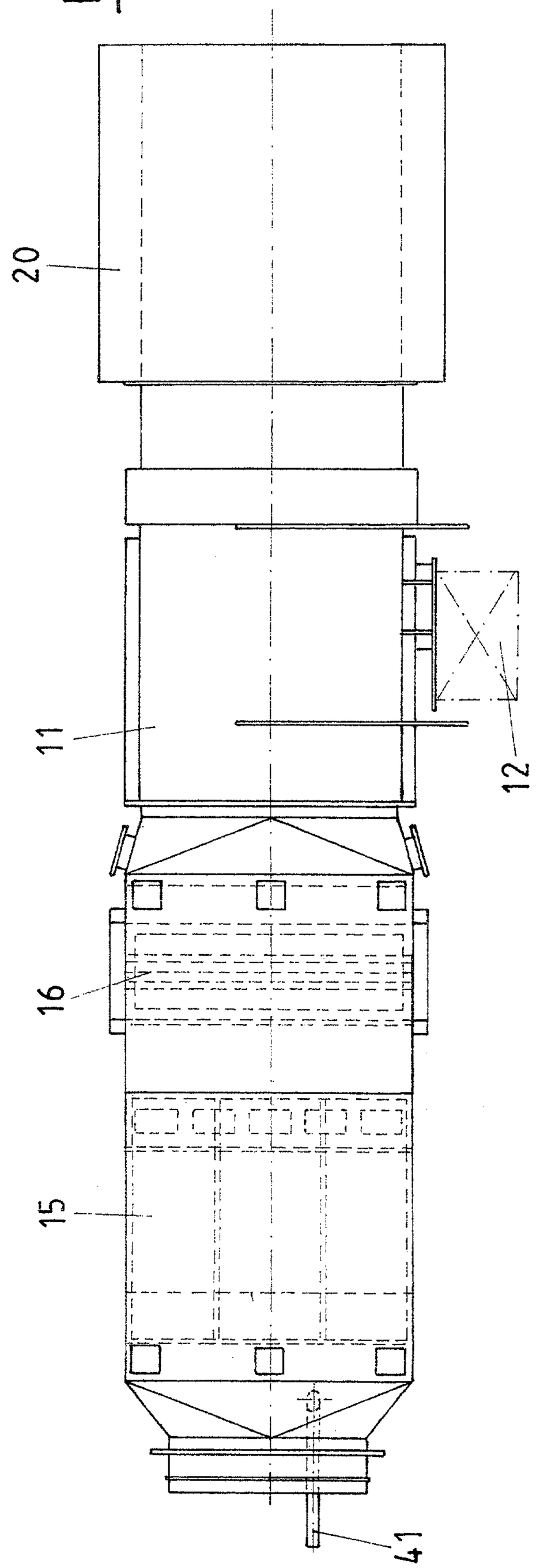


Fig.6

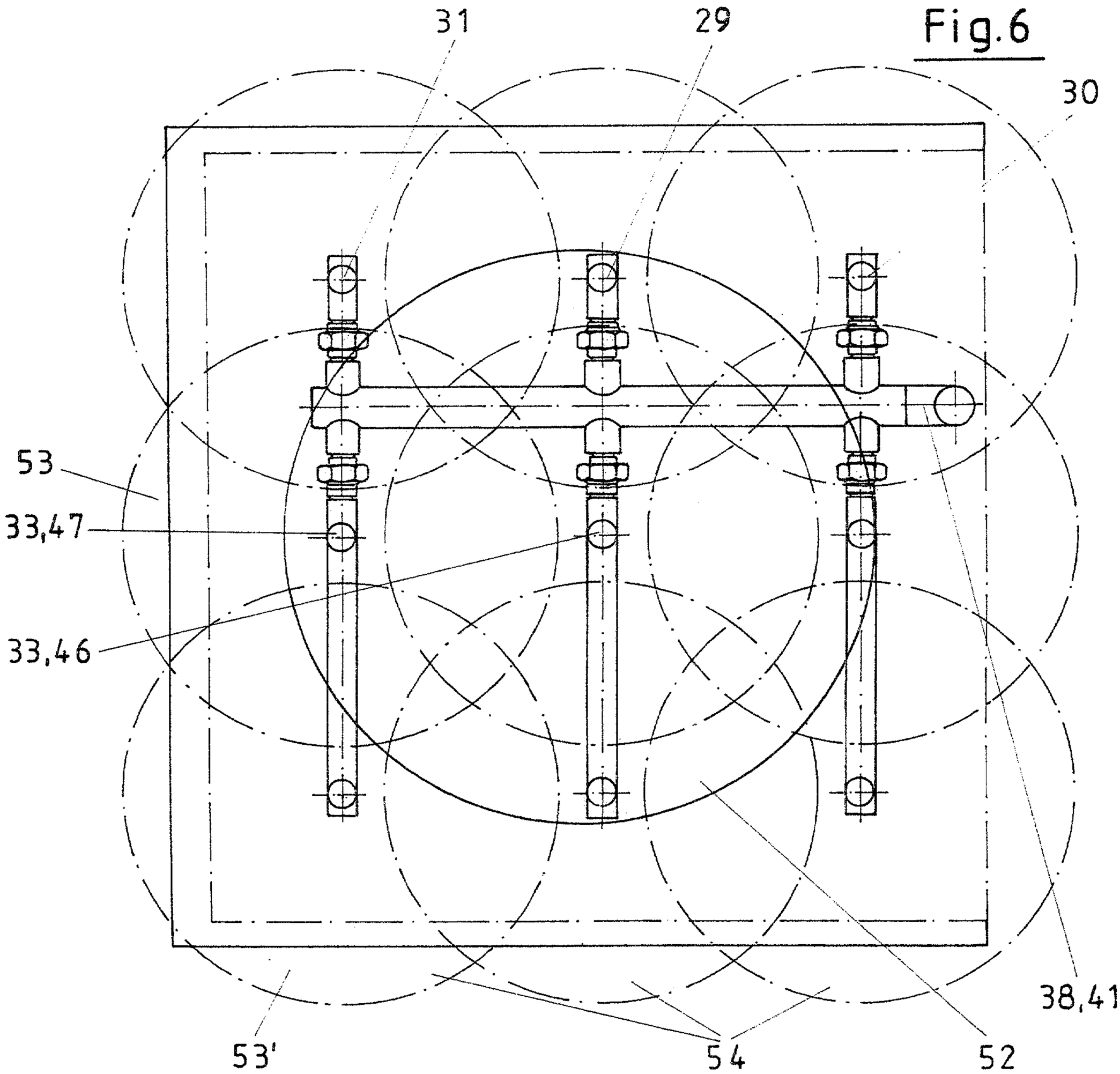


Fig.7

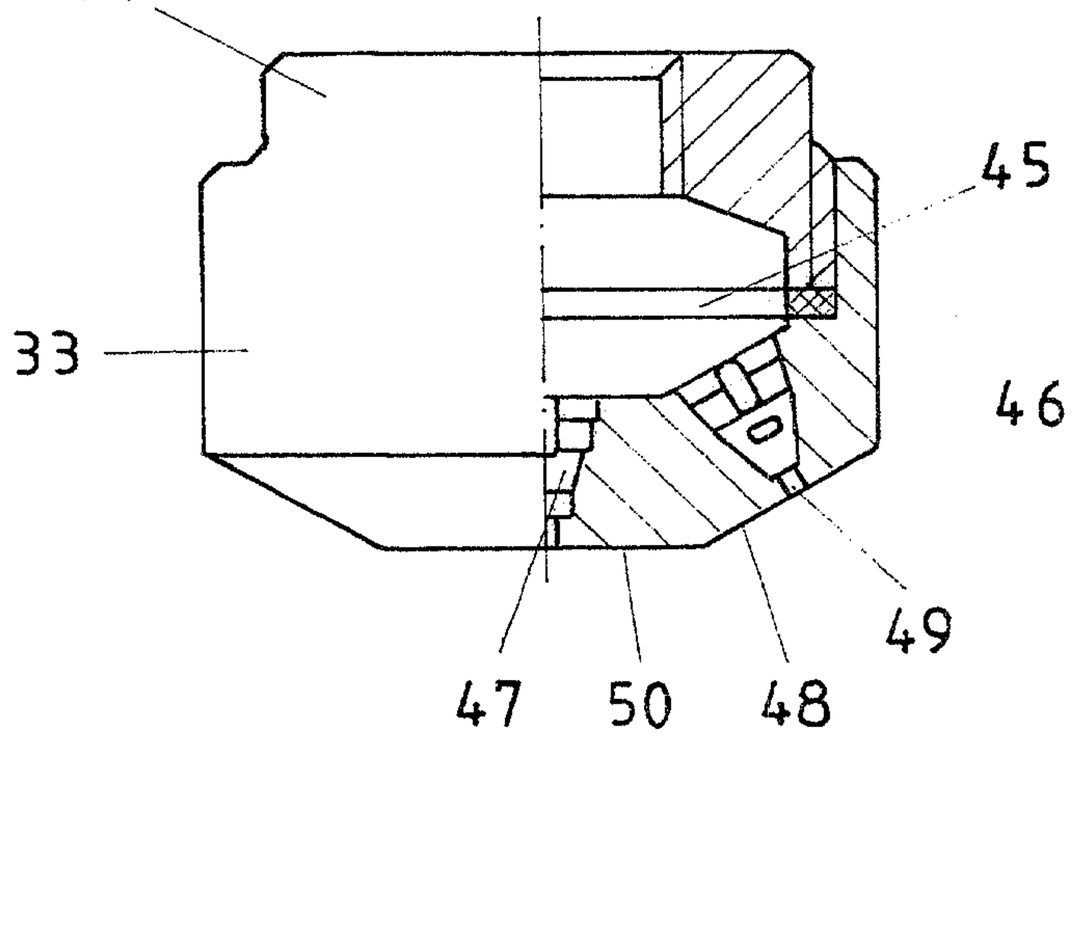
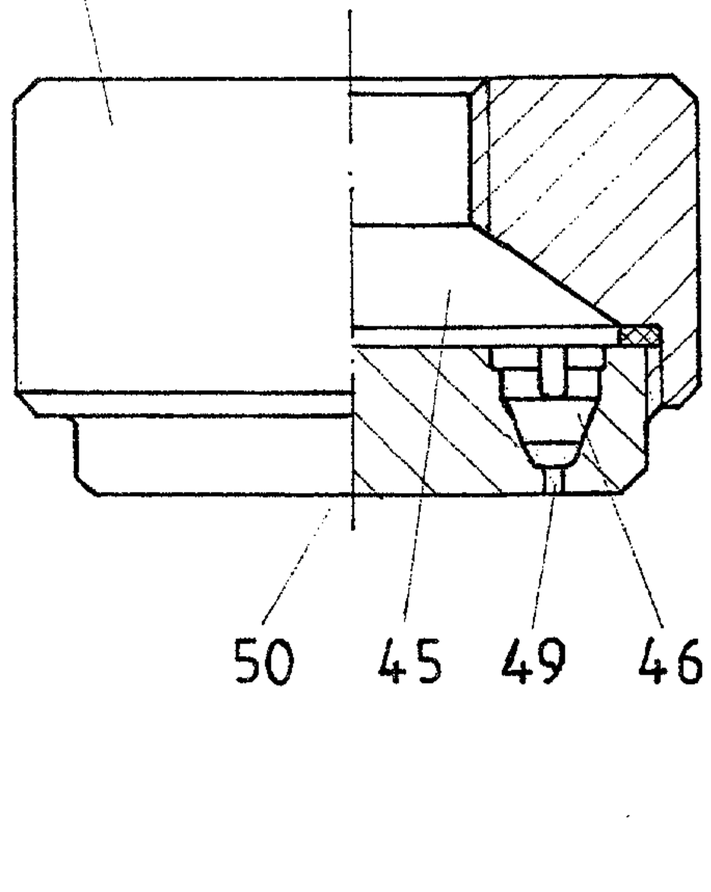
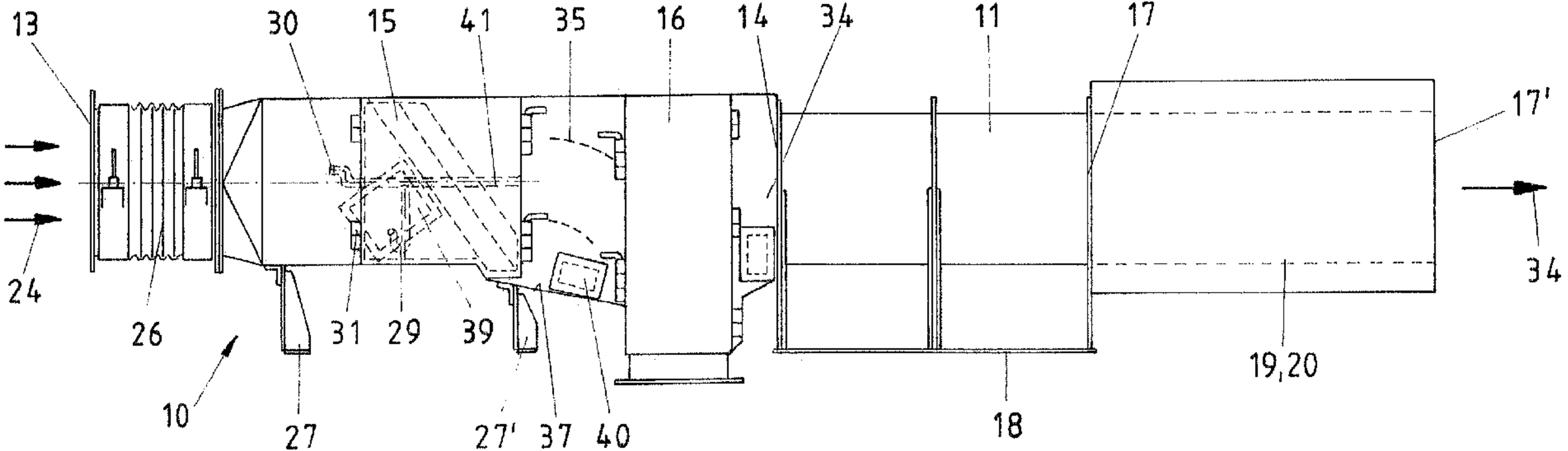


Fig.8

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