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71 Applicant: **TOMAC MINING PRODUCTS LIMITED**

**Tomac House 39 London Road
Newark Nottinghamshire(GB)**

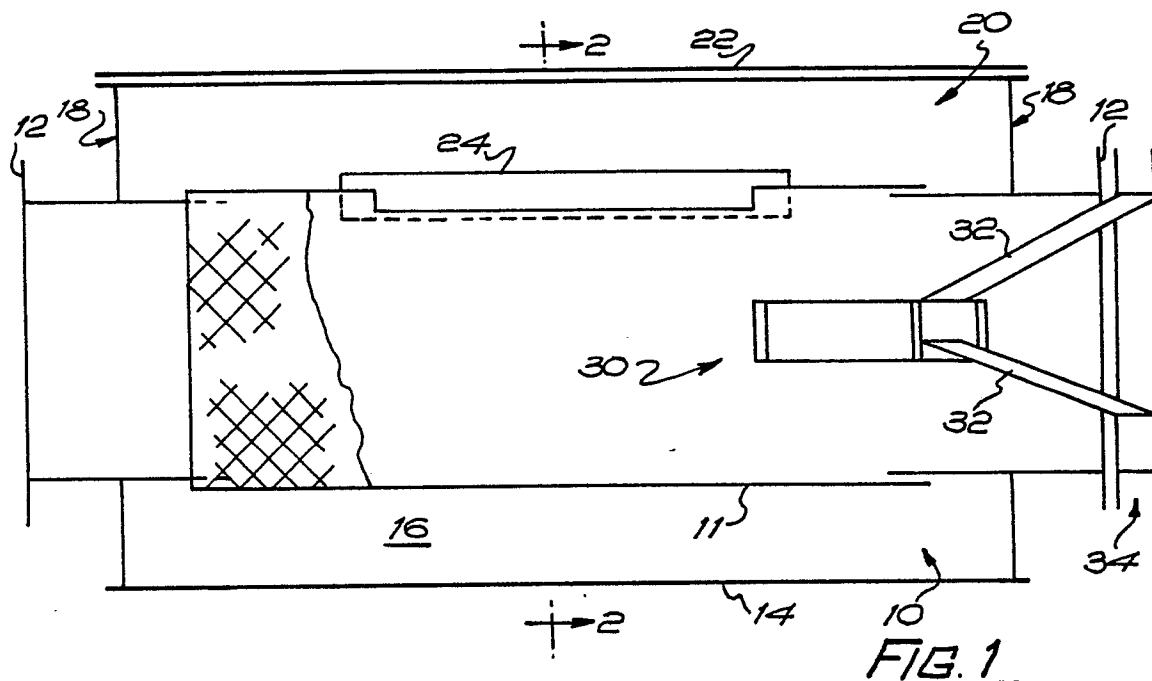
72 Inventor: **Platts, David William**
**Vianney Carr Lane Gringley on the Hill
Near Retford Nottinghamshire(GB)**

74 Representative: **Gura, Henry Alan et al**
**MEWBURN ELLIS & CO. 2/3 Cursitor Street
London EC4A 1BQ(GB)**

54 **Silencer for gas flow apparatus.**

57 A silencer, for gas flow apparatus, which includes sound absorbent material.

To achieve a high degree of endways silencing and to prevent the spread of sound along the axis of ducting in which the silencer is installed, the silencer includes a silencer pod (30) forming a finger of sound absorbent material at the axis of the ducting.



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Silencer for gas flow apparatus.

The invention relates to silencers for gas flow apparatus, and in particular to silencers for the auxiliary fans used in the ventilation ducts in coal mines.

In an effort to reduce the amount of noise produced by auxiliary fans in coal mines, it has become usual to surround a length of the inlet ducting to a fan, or a length of the outlet ducting, or perhaps both (depending on the noise level produced by the fan in its unsilenced condition) with a sound deadening material. These materials work quite well when new but gradually become less effective as they become clogged with dirt and coal dust. When this happens the material has to be removed for cleaning or for renewal, and this has in the past been a time consuming operation and one which has not always been able to be carried out between the normal working shifts. It has been necessary to disconnect the lengths of silenced ducting from the ventilation run concerned and this has caused the removal and renewal of the sound deadening material to be a particularly time consuming operation.

Attempts have been made to reduce the time required to renew the sound deadening material used in silencers associated with auxiliary fans. For example, such installations have been surrounded by outer casings made of a synthetic plastics material to facilitate access to the sound attenuating material within them. However, synthetic plastics materials are not entirely suitable materials for use in this connection in coal mines.

The invention as claimed seeks to provide a particularly effective form of silencer of which the sound attenuating material can very easily be renewed.

The advantages offered by the invention are mainly that a silencer embodying the invention results in a very effective endways silencing and prevents the spread of sound along the axis of the ducting in which the silencer is installed. A further advantage is that the silencer does not affect the flow of air along the ducting or interfere with the routine inspection of a fan within the ducting by a maintenance worker.

One way of carrying out the invention is described in detail below with reference to the drawings, of which:-

Figure 1 is a diagrammatic longitudinal section through a silencer embodying the invention, the silencer being particularly intended for silencing the noise produced by a fan in a coal mine,

Figure 2 is a transverse section on the line 2-2 in Figure 1,

Figure 3 is a diagrammatic plan view,

Figure 4 is a perspective view of a so-called silencer pod for use in association with the silencer of Figures 1 to 3,

Figure 5 is an exploded view of the pod,

Figure 6 is an exploded perspective view of a slightly modified form of silencer embodying the invention, and

Figure 7 is a perspective view which illustrates one of a number of quick release fasteners which will be referred to.

Referring now to Figures 1 to 3 of the drawings, the fan silencer there illustrated includes what is in effect a length of ducting generally indicated 10 for connection either on the inlet side or on the outlet side of an auxiliary fan in a coal mine for example, the opposite ends of the ducting being provided with respective flanges 12,12 for this purpose.

A major length of the ducting 10 is surrounded by a generally cylindrical outer casing 14 to produce a generally annular space 16 surrounding the length of ducting, the space 16 being closed at its opposite ends by respective end walls 18,18. A major length 11 of the ducting within the outer casing is rotatably mounted relative to the outer casing on spigot portions of the ducting which pass through the end walls 18,18. Said major length of ducting is made of a heavy duty steel mesh material so that sound waves are able to travel radially outwards through its walls with a corresponding reduction in the sound waves passing along the ducting beyond the silencer.

The outer casing is provided with a longitudinally extending access aperture 20 through which sound deadening material can be entered into the casing to be packed around the length of ducting within it. The access aperture 20 is provided with a closure panel 22 which can be fixed in position by means of quick release fastenings (not shown).

In the drawings, the sound deadening material is shown to be provided in the form of an elongate blanket of material 21 which can be fed into the casing through the access aperture 20, the feeding of the material through the access aperture being facilitated by the rotation of the rotatable length of ducting. However, it will be understood that the sound deadening material need not necessarily be provided in this form. For example, it could alternatively be provided in the form of a connected series of elongate silencer elements which can be fed through the access aperture for each element to extend longitudinally of the generally annular space within the outer casing.

The side wall of the ducting within the outer

casing is provided, as shown, with a removable cover plate 24 covering an opening through which, in use of the silencer, a maintenance worker can gain access to the interior of the ducting for the purpose of carrying out routine inspection of the adjacent fan, that is to say for example, for carrying out a visual inspection of the fan to check on the build-up of dust and dirt and to check on the condition of the fan bearings in normal manner.

The closure panel 22 for the access aperture in the outer casing is provided with means whereby a de-gassing operation can be carried out, as is sometimes required in coal mines. In the illustrated example, these means are shown to take the form of a pair of slidable plates 26,26 which can be operated to allow a controlled flow of air into the ventilation ducting through respective inlet ports 28,28 in the closure panel.

Referring now to Figures 4 and 5, these illustrate the construction of a so-called silencer pod generally indicated 30 in Figures 1 to 3. As shown in Figures 1 and 2, the pod is of generally cylindrical shape and is located at the axis of the ducting by three inclined arms 32 which are equally spaced within a carrier ring 34. The carrier ring is a flanged ring adapted to be located between one of the flanges 12 of the length of ducting 10 and a similar flange of a length of adjacent ducting so that the pod in this instance is located within the rotatably mounted length of ducting 11.

As shown in Figures 4 and 5, the pod consists of two steel cylinders 34,36 joined together by two lengths of steel strip 38. A coiled length of sound absorbant material 40 is located between the lengths of steel strip and wire mesh material 42 wound around the assembly retains the sound absorbant material in position. The ends of the pod are capped with wire mesh material held in place with steel bands 44 riveted in position as shown in Figure 4.

It has been found that the use of a silencer pod, in combination with a fan silencer comprising sound deadening material surrounding a length of ducting, results in a very effective endways silencing and prevents the spread of sound along the axis of the ducting. In other words, with the silencing pod in use and providing a finger of sound absorbing material at the axis of the length of ducting, there has been obtained a far greater degree of silencing than has been possible when using a sound deadening material surrounding the length of ducting alone. Because of the relatively small diameter of the pod it does not affect the flow of air through the ducting or the routine inspection of the fan by a maintenance worker. It has been found advantageous for the cross sectional area of the ducting surrounding the pod to be somewhat greater than the cross sectional area of the outlet

ducting from the fan.

When the pod has been in use for an extended period of time, it may be advantageous for the sound absorbing material of which it is made, and which may have become clogged with dust and dirt, to be removed and replaced by new material. This can be done by a maintenance worker gaining access to the interior of the ducting by removing the cover plate 24 as previously described.

Thus there is provided a fan silencer which it is thought will be particularly advantageous for use in coal mines. However, various modifications may be made. For example, referring to Figure 6, the fan silencer there illustrated is basically the same as that illustrated in Figures 1 to 3 but in this case it can be seen that the major length 11 of the ducting within the outer casing, made of heavy duty steel mesh material, has longitudinally extending stringers 110 and circumferentially extending ribs 112. Opposite end portions of the stringers slidably engage the radially outer surfaces of respective spigot portions 114 of the ducting which pass through the end walls 18. A series of apertured metal tabs 116 are welded to the free edges of the steel mesh material defining the opening through which a maintenance worker can gain access to the interior of the ducting. Similar apertured metal tabs 118 are welded to the edges of the cover plate 24 and screws 120 are provided for engaging the respective pairs of apertures to secure the cover plate in position.

As shown, in this case the access aperture 20 is provided with a pair of closure panels 22 arranged side by side. A pair of angle pieces 122,122 extend in back to back relation across the aperture 20 and are bolted between pairs of brackets 124,124 welded within the access aperture as shown. The arrangement is such that if the fastenings by means of which the closure panels are fixed in position are slackened off, said panels can be wedged partially open, either selectively or together (using any convenient items as wedges beneath the edges of the panels). The closure panels are in this case not provided with slidable plates to allow controlled flow of air into the ventilation ducting. The partial wedging open of the closure panels referred to is a convenient alternative method whereby a de-gassing operation can be carried out.

In this view there is also shown, at a leading end of the blanket of sound deadening material 21, a plurality of hooks 23 which can be engaged with the steel mesh material of the rotatable length of ducting to facilitate the feeding of the sound deadening material through the access aperture. (Such hooks could of course also be provided in the case where the sound deadening material is provided in the form of a connected series of elongate silencer

elements). The carrier ring 34 for the pod is again located between one of the flanges of the fan silencer and a similar flange (not shown) of a length of adjacent ducting.

In Figure 7 there is illustrated the construction of the fastenings by means of which the closure panels are fixed in position. As shown, each fastening is constituted by a screwthreaded stud 124 which extends through a hole in a flange surrounding the access aperture 20 and is secured by a nut 126 on the underside of the flange. A toggle member 128 extends across a slot in the stud, and a pin 130 which extends diametrically of the stud passes through a slot 132 in the toggle member.

As shown, the general direction of the slot 132 in the toggle member is inclined relative to the parallel sides of said member and, as viewed in Figure 7, the lower surface of the slot has a scallop-like form. The result is that when all the toggle members are brought to the positions in which they are shown in Figure 6, that is to say extending axially of the studs to which they are connected, the closure panels can be removed. When the closure panels have been replaced, each toggle member can be turned to the position shown in full lines in Figure 7 and can be struck with a hammer to bring about a wedging action. The scallop-like form of the lower surface of the slot in each toggle member causes the toggle member to remain in the wedging position to which it has been brought by the hammer blow.

Various other modifications may be made, and it will be understood that a fan silencer embodying the invention may be used otherwise than in the ventilation ducting of coal mines. For example it may be used in connection with any noisy producer of a gas flow, for example a gas turbine (where there would be a requirement for periodic cleaning of the element) or a paraffin fired gas heater.

Claims

1. A silencer for gas flow apparatus, characterised in that it includes a silencer pod (30) forming a finger of sound absorbent material for fitment in a length of gas flow ducting, the pod being located by a carrier ring (34) adapted to be located between adjacent flanges in a length of the ducting, and said pod being constituted by a coiled length of sound absorbent material (40) with wire mesh (42) wound around the coiled length of material.

2. A silencer according to claim 1, in which the ends of the pod are capped with wire mesh (42).

3. A silencer according to either one of the preceding claims, in which the silencer pod consists of two steel cylinders (34,36) joined together

by two lengths of steel strip (38), the coiled length of sound absorbing material (40) being located between the lengths of steel strip before the wire mesh (42) has been wound around the assembly.

4. A fan silencer including a length of ducting for connection either on the inlet side or the outlet side of a fan, a major length of the ducting (10) being surrounded by a generally cylindrical outer casing (14) to produce a generally annular space (16) surrounding the length of ducting, the generally annular space being closed at its opposite ends by respective end walls, the outer casing being provided with a longitudinally extending access aperture (20) through which sound deadening material (21) can be entered into the casing to be packed around the length of ducting within it, the access aperture being provided with a closure panel (22) or with two or more closure panels (22) arranged side by side, characterised in that the fan silencer is provided in combination with a silencer pod (30), according to any one of the preceding claims, providing a finger of sound absorbing material at the axis of the silencer, the silencer pod being located either within the fan silencer or within a length of the ducting in which the fan silencer is located.

5. A fan silencer and silencer pod combination according to claim 4, in which the cross sectional area of the ducting surrounding the pod (30) is greater than the cross sectional area of the outlet ducting from the fan.

6. A fan silencer and silencer pod combination according to either one of claims 4 and 5, in which at least a major length (11) of ducting (10) within the outer casing (14) of the silencer is constructed in a manner or of a material such that sound is able to travel radially outwards through the walls and rotatable relative to the outer casing (14) so that the sound deadening material to be packed around the length of ducting (11) within the casing may be provided in the form of an elongate blanket of material (21) which can be fed into the casing through the access aperture (20).

7. A fan silencer and silencer pod combination according to claim 6, in which a leading end of the elongate blanket of material (21) is capable of being connected to a part of the rotatable length of ducting (11).

8. A fan silencer and silencer pod combination according to any one of claims 4 to 7, in which a side wall of the ducting within the outer casing is provided with a removable cover plate (24) covering an opening through which, in use of the silencer and pod combination, a maintenance worker can gain access to the interior of the ducting for the purpose of carrying out routine inspection of

the adjacent fan and for the purpose of renewing the sound absorbing material of which the silencer pod (30) is made.

9. A fan silencer and silencer pod combination according to any one of claims 4 to 8, in which the or each closure panel (22) for the access aperture (20) in the outer casing (14) is such that, or is provided with means whereby, a de-gassing operation can be carried out.

10. A fan silencer and silencer pod combination according to claim 9, in which the means whereby a de-gassing operation can be carried out take the form of means whereby the or each closure panel (22) can be partly wedged open or take the form of a pair of slidable plates (26,26) which can be operated to allow a controlled flow of air into the ventilation ducting through respective inlet ports (28,28) in the closure panel or panels (22) for the access aperture (20).

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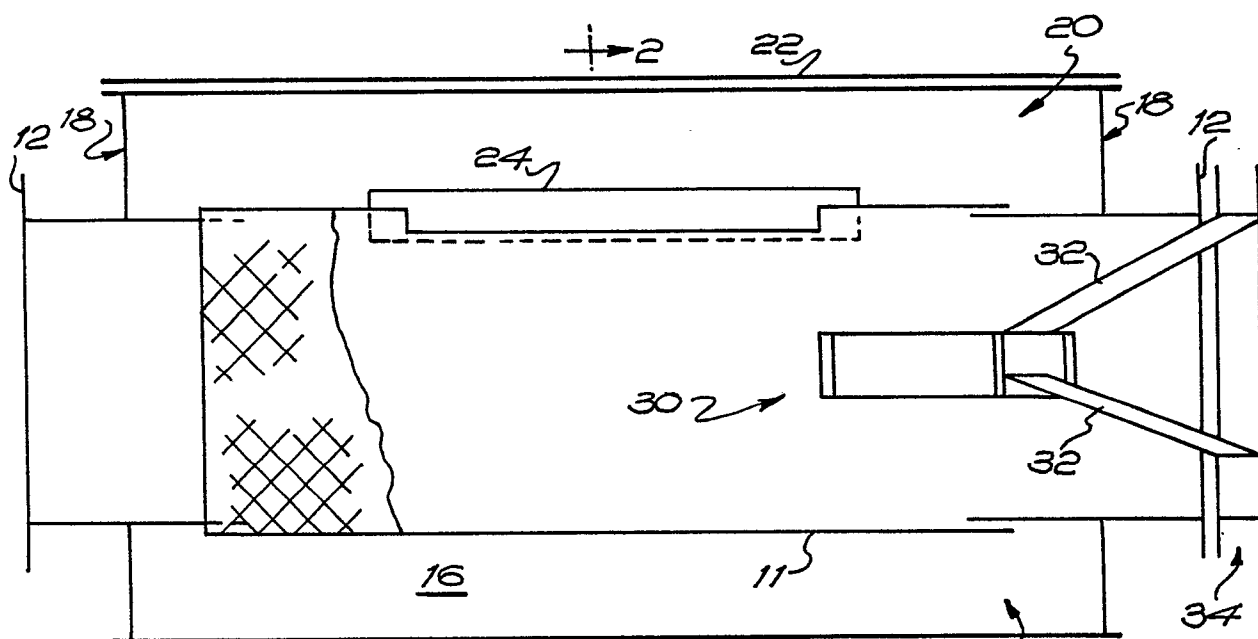


FIG. 1.

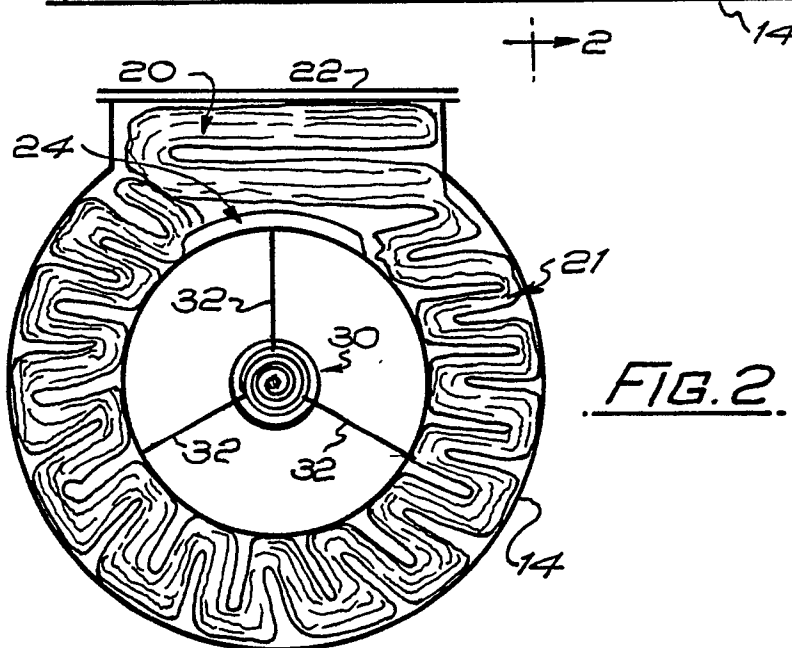


FIG. 2.

FIG. 3.

