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Agnew et al.

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[54] **APPARATUS FOR INDUCING AIR FLOW**

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[73] Assignee: **Coal Industry (Patents) Ltd.,** London, England

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **239/428.5;** 98/50; 261/25; 261/116; 261/DIG. 75; 417/76

[51] **Int. Cl.²** **F04F 5/02**

[58] **Field of Search** ..... 239/318, 425.5, 428.5, 239/433, 434; 417/76, 87, 151, 155, 179; 98/50; 261/25, 28, 76, 115, 116, DIG. 75; 217/83

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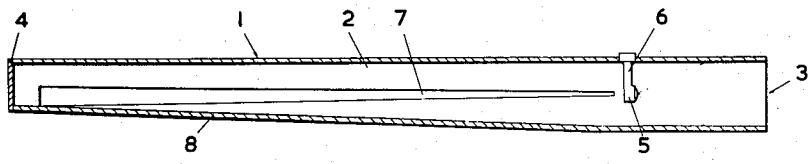
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[57] **ABSTRACT**

An air flow inducing device is formed by a tubular member open at one end with a liquid spray directed towards the open end. A wedge shaped slot extends longitudinally along the tubular member to provide an air flow inlet.

10 Claims, 4 Drawing Figures



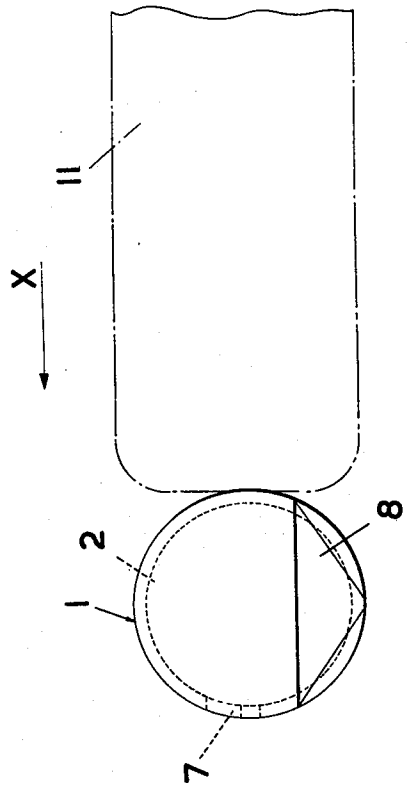


FIG.4.

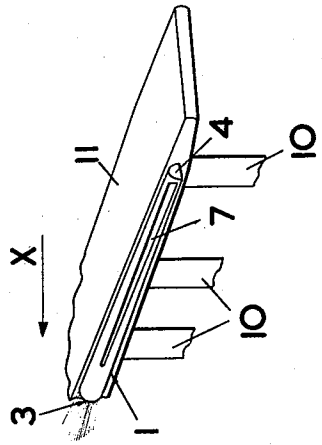


FIG.3.

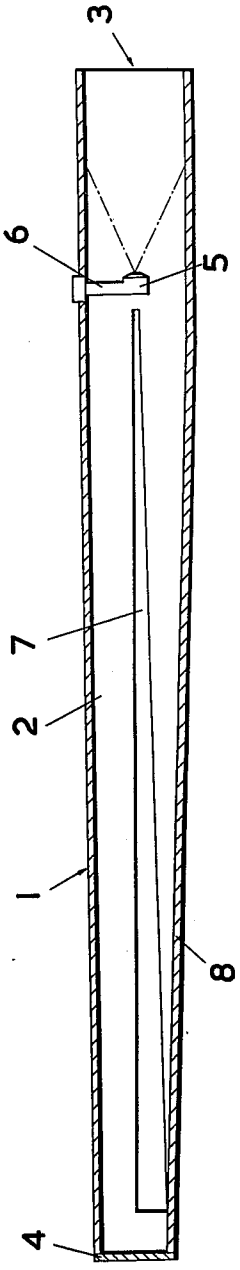


FIG.1.

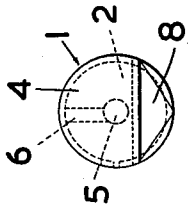


FIG.2.

APPARATUS FOR INDUCING AIR FLOW

This invention relates to apparatus for inducing airflow and in particular the invention relates to such apparatus comprising fluid jets.

An object of the present invention is to provide improved apparatus for inducing airflow.

According to the present invention, apparatus for inducing air flow comprises a member providing an elongated passage which is open at one end, a fluid outlet nozzle arranged to direct a jet of fluid along the passage towards the open end, and air-inlet means extending longitudinally along the member.

Preferably, the air-inlet means comprises a slot formed in the wall of the member and extending logitudinally along the member.

Advantageously, the slot is generally wedge shaped, being tapered inwardly towards the open end of the passage.

The cross-sectional area of the passage may get smaller away from the open end of the passage.

The opposite end of the passage to the open end may, conveniently, be closed by a hinged flap.

By way of example only, one embodiment of the invention will be described with reference to the accompanying drawings in which:

FIG. 1 is a longitudinal section through apparatus for inducing air flow and constructed in accordance with the present invention;

FIG. 2 is an end view of FIG. 1;

FIG. 3 is an incomplete perspective view of the apparatus mounted on an underground mine roof support; and

FIG. 4 is an incomplete end view of FIG. 3 drawn on an enlarged scale.

Referring to FIGS. 1 and 2, the apparatus for inducing air flow comprises a tubular member 1 providing an elongated passage 2 which is open at one end 3 and which is closed at the other end by a hinged flap 4. The flap can be raised to allow access to the passage 2.

A fluid outlet nozzle 5 is mounted on a radial arm 6 extending within the passage 2, the fluid supply being fed from a hose (not shown) via the arm to the nozzle. The nozzle is arranged to direct a jet of fluid, for example, a liquid such as water, towards the open end 3 of the passage.

A generally wedged-shaped slot 7 is formed in the wall of the tubular member 1 and extends longitudinally along one side of the member. The slot 7 is tapered inwardly towards the open end 3 of the passage.

A portion of the base of the tubular member 1 is cut away so that the cross-sectional area of the passage reduces towards the closed end, the "cut-away" portion of the circular tube being replaced by a plate 8. In further modifications of the apparatus the passage is other than circular in cross-section, for example, the passage may have a square, rectangular, or oval cross-section.

In still further modification of the apparatus the fluid outlet nozzle may be located adjacent to the wall of the member. Some modifications of the apparatus comprise a plurality of fluid outlet nozzles.

In operation of the apparatus, fluid, for example, water, is fed to the outlet nozzle 5 via the radial arm 6 and is discharged as a jet directed towards the open end 3 of the passage. The jet of water impinges on the wall of the passages and induces an air flow along the passage towards the open end of the passage, fresh air being drawn into the passage through the slot 7 which forms air inlet means. The slot 7 is tapered so that the resistance to air flow passing through any one portion of the slot reduces as the distance of the portion from the nozzle 5 is increased. Thus, fresh air tends to flow through the slot 7 along the whole length of the slot.

The cross-sectional area of the passage is reduced towards the closed end to ensure that a substantially constant air flow velocity is achieved along the length of the passage, i.e. where the quantity of air flow along the passage is less, the cross-sectional area of the passage is correspondingly reduced.

Referring now to FIGS. 3 and 4 these show the apparatus of FIGS. 1 and 2 secured to a mine roof support installed along a longwall coal face in an underground mine. In the drawings only a part of one roof support is shown but in operation a plurality of similar supports are installed side by side along the whole length of the working face.

The roof support comprises a plurality of legs 10 which are carried on a floor mounted base (not shown) and which support a roof canopy 11 extending from adjacent to the working face towards the goaf. The direction of the main ventilation current along the face is indicated by arrow X.

The member 1 of the apparatus for inducing air flow is secured along the down stream side edge of the roof canopy by means not shown, for example, brackets bolted to the roof canopy. The open end of the passage is directed towards the goaf and the slot 7 is arranged to face downstream with respect to the main ventilation air flow.

In operation, as the working face advances each of the roof supports is advanced in turn towards the working face. To advance a roof support, the operator activates a control valve block (not shown) to retract the legs 10 until the roof canopy 11 is clear of the mine roof. When the roof canopy is just clear of the roof an advancing ram (not shown) anchored to an armoured conveyor arranged along the working face advances the roof support. When the support is fully advanced the legs 10 are extended until the roof canopy is supporting the mine roof. The operation is then repeated with the next adjacent support.

One problem which frequently occurs when the mine roof is of a friable material is that when a conventional roof canopy is lowered from the mine roof, broken rock material tends to fall from the side of the roof canopy into the main ventilation air flow. The broken rock material usually contains a relatively large proportion of fine particles which are carried by the ventilation air flow giving rise to dust clouds.

However, with the roof support as shown in FIGS. 2 or 3 of the drawings, when the operator activates the control valve block to advance the support, control means (not shown) are provided on the roof support to feed a liquid, usually water, along a hose (not shown) to the outlet nozzle 5 within the passage. The water jet so produced induces an air flow out of the open end of the passage towards the goaf, air being drawn into the passage through the slot 7. Thus any fine particles of mineral falling over the side of the roof canopy 11 are drawn through the slot 7 into the passage 2 and then discharged through the open end 3 into the goaf. During the passage of the particles through the jet of water a high proportion tend to become wetted by the water and thereby fall to the goaf floor. The remainder are

directed away from the main ventilation air flow and rather than forming a dust cloud tend to gradually settle onto the goaf floor.

When the roof canopy is reset to the mine roof, the control means cut off the water supply to the nozzle 5.

The hinged flap 4 enables an operator to remove any particles of rock which may have settled inside the passage 2.

In modifications of the invention apparatus for inducing an air flow is provided on each side edge of the roof canopy.

We claim:

1. Apparatus for inducing air flow comprising an elongated narrow member defining an elongated narrow passage which is open at one longitudinal end, a fluid outlet nozzle mounted in the member near the open end and arranged to direct a jet of fluid along the passage toward the open end, and air-inlet means comprising a long, narrow, lateral opening extending longitudinally along a substantial portion of the member for inducing air flow into the member through all of the long narrow opening.

2. Apparatus as claimed in claim 1, in which the air-inlet means comprises a slot formed in the wall of the member and extending longitudinally along the member from a position spaced slightly from the open end to a position near the opposite end.

3. Apparatus for inducing air flow comprising an elongated member defining an elongated passage which is open at one longitudinal end, a fluid outlet nozzle arranged to direct a jet of fluid along the passage toward the open end, and air-inlet means comprising a long, narrow, lateral opening extending longitudinally along a substantial portion of the member, in which the air-inlet means comprises a slot formed in the wall of the member and extending longitudinally along the member from a position spaced slightly from the open end to a position near the opposite end, and in which the slot is generally wedge shaped, being tapered inwardly toward the open end of the passage.

4. Apparatus as claimed in claim 3, in which the cross-sectional area of the passage reduces in a direction away from the open end of the passage.

5. Apparatus as claimed in claim 1 wherein the member is positioned laterally on a side of a support and wherein the air-inlet means is in a wall of the member opposite the support whereby ambient air and particulate material are drawn into the inlet-means laterally of the support over a substantial portion of the member for preventing dust from falling along the side of the support.

6. Apparatus as claimed in claim 1 wherein the elongated member is a tube tapered inwardly toward the end opposite the open end.

7. Apparatus for inducing air flow comprising an elongated member defining an elogated passage which is open at one longitudinal end, a fluid outlet nozzle arranged to direct a jet of fluid along the passage toward the open end, and air-inlet means comprising a long, narrow, lateral opening extending longitudinally along a substantial portion of the member wherein the elongated member is a tube tapered inwardly toward the end opposite the open end, and wherein the tube has a generally cylindrical wall and wherein a bottom portion of the tube has been removed and has been replaced by a flat plate joined with the tube wall at a slight angle to an axis of the tube.

8. Apparatus as claimed in claim 1 wherein an end of the elongated member opposite the open end is closed by a hinged cover.

9. Apparatus for inducing air flow comprising a member defining an elongated passage which is open at one end and closed at the other end, a fluid outlet nozzle arranged to direct a jet of fluid along the passage towards the open end, and air-inlet means defining a slot extending longitudinally along a substantial portion of the member, a cross-sectional area of the passage reducing along a substantial portion of its length in a direction away from the open end of the passage.

10. Apparatus for inducing air flow comprising a member defining an elongated passage which is open at one end and closed at the other end, a fluid outlet nozzle arranged to direct a jet of fluid along the passage toward the open end, and air-inlet means defining a wedge-shaped slot tapering inwardly toward the open end of the passage and extending longitudinally along a substantial portion of the member, a cross-sectional area of the passage reducing along a substantial portion of its length in a direction away from the open end of the passage.

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