Oct. 20, 1970 E. B. WAGNER 3,535,066

FLAME ARRESTER

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Fig. 1

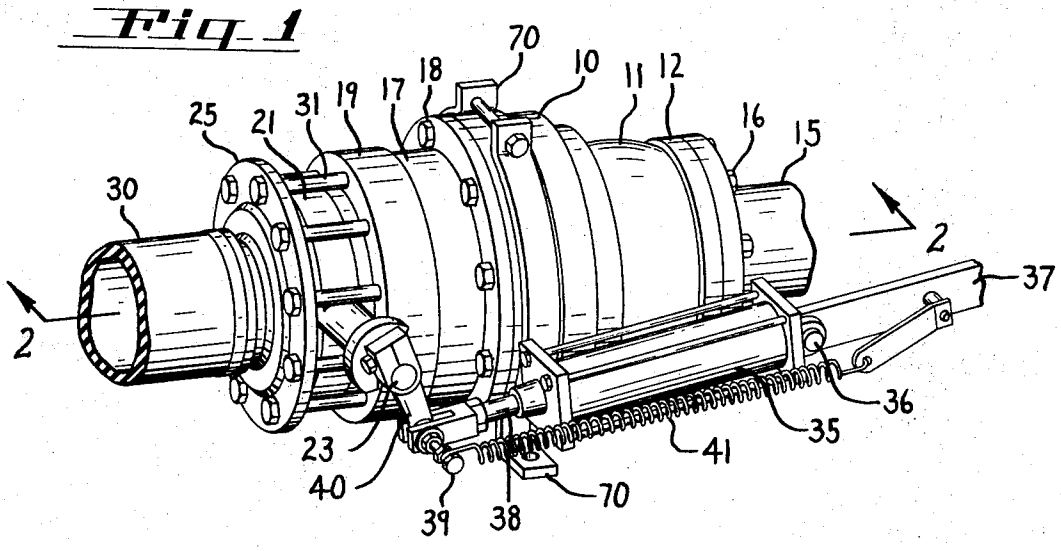
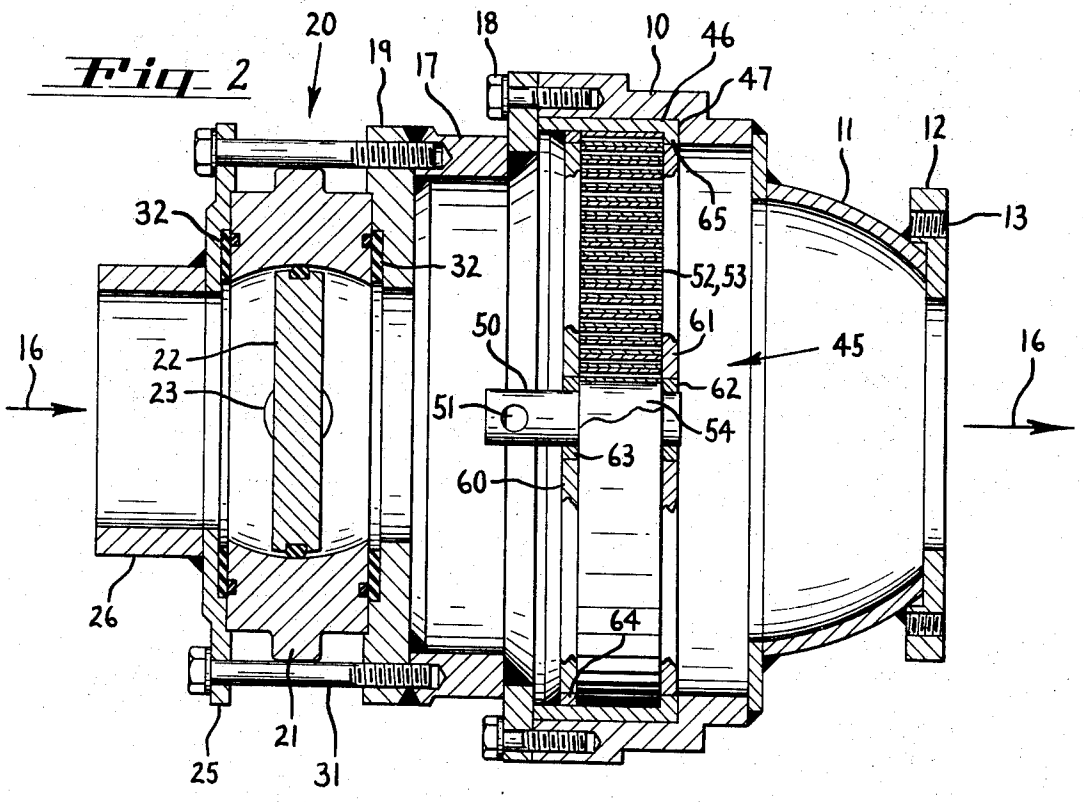


Fig. 2



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Fig 3

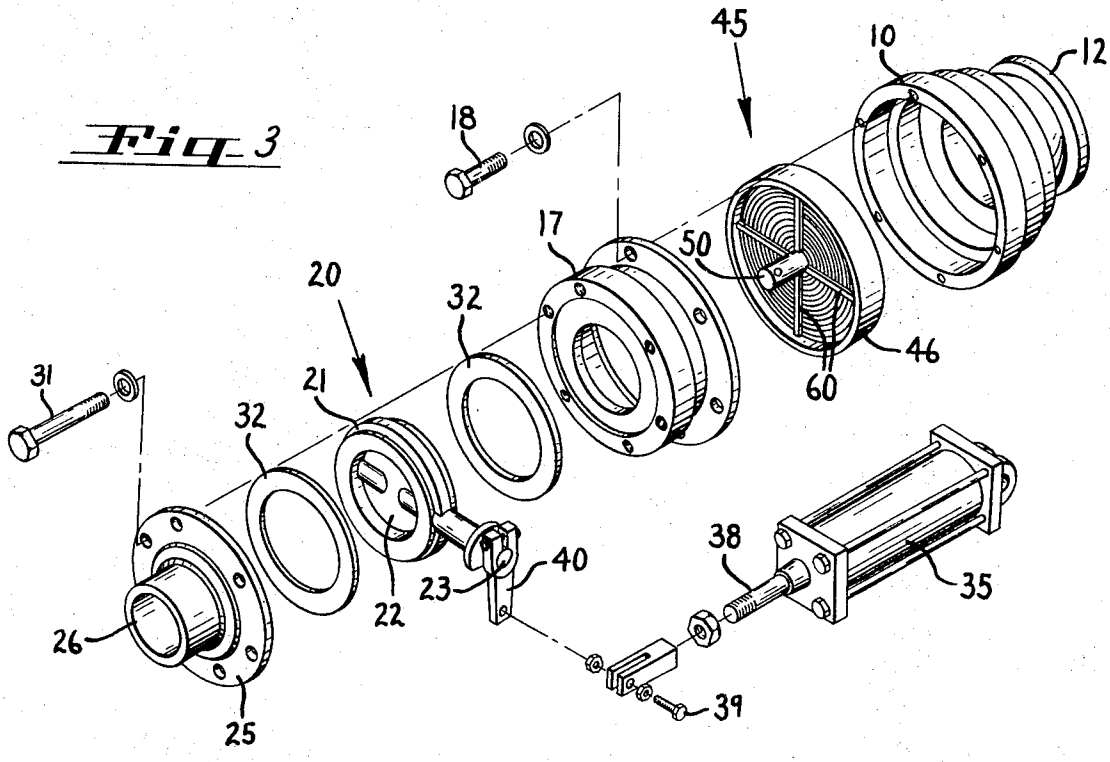
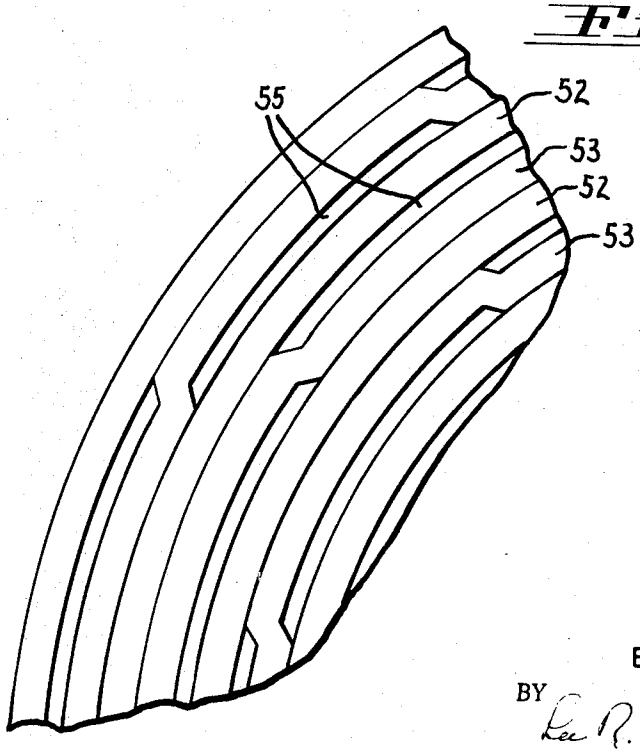


Fig 4



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FLAME ARRESTER

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ABSTRACT OF THE DISCLOSURE

A flame arrester for the air intake of an internal combustion engine. A cylindrical housing contains a coil wound from two strips of metal, one corrugated and one flat, forming narrow axial air passages. The housing is made of separable parts for removal of the coil for cleaning. One housing part contains a butterfly valve to shut off the air supply to the engine. The valve is spring closed and normally held open by an air cylinder which is part of a safety system for the engine.

BACKGROUND OF THE INVENTION

This invention relates to a flame arrester for the intake of an internal combustion engine.

It is necessary in mining work and other applications to provide a flame arrester to prevent explosion hazard from the backfiring of the engine through its air intake. Flame arresters for this purpose have heretofore been excessively heavy and bulky, expensive to manufacture and difficult to clean. They must be taken apart and cleaned periodically to keep the multitude of minute air passages free and unobstructed by dirt and other material which may lodge therein.

As an additional safety feature, it is also necessary in mine work to provide a valve in the air intake which will close automatically and stop the engine instantly in the event of overheating. For the sake of reliability and certainty of operation in an emergency, it is desirable to make such safety devices as simple and trouble free as possible. It is also desirable that they be as small and compact as possible in view of the number of other accessory devices necessary on the engine and it is desirable that they not add excessively to the cost of the equipment.

SUMMARY OF THE INVENTION

The present flame arrester is built as a unit which includes an emergency air shutoff valve. This unit is arranged for connection between the intake manifold and the air cleaner. A plurality of housing parts are bolted together for convenient removal of the flame arrester element for cleaning. The flame arrester element itself comprises a transversely corrugated strip of stainless steel and a flat strip. These two strips are coiled about a central spud which provides means for lifting the element out of the main housing part in a convenient manner.

One of the housing parts contains a butterfly valve to shut off the air supply. The valve is normally held open against spring tension by an air cylinder.

Objects of the invention are, therefore, to provide an improved flame arrester for internal combustion engines, to provide a flame arrester and shutoff valve incorporated in a unitary assembly and to provide a compact and economical form of construction which is easy to take apart for cleaning.

The invention will be better understood and the foregoing and other objects and advantages will become apparent from the following description of the preferred embodiment illustrated in the accompanying drawings. Various changes may be made in the details of construction and arrangement of parts and certain features may

be used without others. All such modifications within the scope of the appended claims are included in the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a flame arrester and air shutoff valve incorporating the principles of the invention;

FIG. 2 is a view on the line 2—2 in FIG. 1;

FIG. 3 is an exploded view of the device; and

FIG. 4 is a greatly enlarged fragmentary view of the flame arrester coil.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Cylindrical main housing **10** includes as an integral part thereof a reducer section **11** having an end flange **12** with tapped holes **13** whereby the housing is mounted on the flanged end of intake pipe **15** by means of bolts **16**. Pipe **15** is connected with the intake manifold of the engine, the direction of air flow being indicated by the arrows **16** in FIG. 2. A cylindrical flange cover **17** is secured to the front end of housing **10** by cap screws **18**. Flange cover **17** includes as an integral part thereof an annular front plate **19**.

A valve unit **20** is mounted on flange cover **17**. Valve **20** comprises a housing **21** containing a butterfly valve **22** mounted on a shaft **23**. A circular flange end plate **25** having bolt holes around its periphery is welded to a connector tube **26**. Tube **26** is welded or slipped into the intake pipe **30** leading from the air cleaner. Cap screws **31** in flange cover **17** clamp the valve housing **21** between flange plate **25** and front plate **19**. Washers **32** are provided in the two joints on opposite sides of valve body **21**.

Butterfly valve **22** is normally held open by air pressure in the head end of a single acting air cylinder **35**. Cylinder **35** is pivotally mounted at **36** on a supporting bracket **37**. A piston rod **38** in cylinder **35** is pivotally connected to a pin **39** in an arm **40** on the end of shaft **23**. Upon failure of air pressure in cylinder **35**, the butterfly valve **22** is closed by a tension spring **41** connected between bracket **37** and pin **39**. The apparatus is used on an engine having an air pressure safety system which normally maintains air pressure in cylinder **35**. Upon overheating of the engine, the air safety system exhausts down to atmospheric pressure allowing spring **41** to close the valve, stopping the engine.

The flame arrester unit is indicated generally at **45**. This unit is incorporated in a cylindrical shell **46** which fits within housing **10** and seats on a shoulder **47** in the housing. The unit is held in this position by flange cover **17**. In the center of the unit is an axial spud **50** having a hole **51** for lifting the unit out of the housing **10** when flange cover **17** is removed.

As shown in FIG. 4, the functional part of unit **45** comprises a flat strip of stainless steel **52** welded at intervals to a transversely corrugated strip **53**. After the two strips have been welded together, one end of the composite strip is welded to an enlargement **54** on spud **50** and then the composite strip is wound upon itself until it reaches a diameter to fill the shell **46**. This provides a multitude of axial openings **55** which are narrow in a radial direction. Air for the engine passes freely through these openings but the narrowness of the openings prevents the passage of flame when the engine backfires.

The coiled strips **52**, **53** are retained in shell **46** by a front spider **60** and a back spider **61**. Back spider **61** comprises four radial bars welded between an inner ring **62** and a flanged end **65** on shell **46**. Front spider **60** comprises four radial bars welded between an inner ring **63** and an outer ring **64**. Outer ring **64** is welded to shell **46**.

Inner rings **62** and **63** seat against the shoulders formed by enlarged portion **54** of spud **50**.

In order to clean the flame arrester unit **45** and inspect the valve unit **20**, the cap screws **16** and **31** are removed, disconnecting the two units from each other and from the pipes **15** and **30**. Removal of cap screws **18** then separates flange cover **17** from housing **10**, allowing flame arrester unit **45** to be lifted out of the housing by spud **50**. Clamp **70** provides a convenient detachable mounting for the housing assembly.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. A safety device for the air intake of an internal combustion engine comprising a plurality of circular housing sections detachably secured together in end to end relation in axial alignment for substantially straight line flow of air through said sections, said section comprising in sequence from the inlet end to the outlet end of the device a flange end plate having an inlet connector tube, a valve housing containing a butterfly valve, a flange cover, and a flame arrester housing having a flanged outlet end for connection with the air intake pipe of the engine; axial cap screws through said flange end plate having threaded engagement with said flange cover and clamping said valve housing therebetween, and axial cap screws securing said flange cover to the inlet end of said flame arrester housing; a flame arrester in said flame arrester housing seated against an annular internal shoulder therein and retained by said flange cover, and an axial spud projecting in an upstream direction from the center of said flame arrester for lifting the flame arrester out of said housing when said housing is separated from said flange cover by removal of said last mentioned cap screws.

2. A device as defined in claim **1** including a spring for closing said valve, and a pneumatic cylinder arranged to hold said valve open against the tension of said spring.

3. A device as defined in claim **1**, said flame arrester comprising a cylindrical shell seated on said shoulder, a coil of flat and corrugated strips in said shell, said axial spud being in the center of said coil, and radial spokes on opposite sides of said coil extending between said spud and said shell.

4. A device as defined in claim **1**, said flame arrester comprising a cylindrical shell having an inwardly directed flange on one end thereof, a coil of flat and corrugated strips in said shell, said axial spud being in the center of said coil and having shoulders on opposite sides of said coil, a pair of inner rings on said spud seated against said shoulders, radial spokes welded between said flange and one of said rings on one side of said coil, an outer ring welded to said shell on the opposite side of said coil, and radial spokes welded between said outer ring and the other of said inner rings.

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