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McElhose et al.

[11] **3,791,282**

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[54] **WEATHER CAP FOR EXHAUST PIPE**

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[52] **U.S. Cl.** **98/59**

[51] **Int. Cl.** **F23l 17/02**

[58] **Field of Search** ..... 98/59; 24/274 R; 251/299

[56] **References Cited**

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Assistant Examiner—Peter D. Ferguson

[57] **ABSTRACT**

A weather cap for an upstanding exhaust pipe includes a cover flap which, in the absence of gas pressure within the exhaust pipe, covers the exhaust port and, in the presence of gas pressure, pivots upwardly to permit escapage of the gas. The cover flap is pivotally secured to the exhaust pipe by a flexible band of variable diameter surrounding the outer wall of the exhaust pipe and held in pressure engagement therewith by a worm carried on one end of the band which worm meshes with aligned slots on the opposite end of the band. Since the diameter of the band is variable, the weather cap has universal application and one weather cap is adaptable to various size exhaust pipes. A counterweight carried on the underside of the cover flap aids in the closing of the cover flap when gas pressure ceases.

6 Claims, 5 Drawing Figures

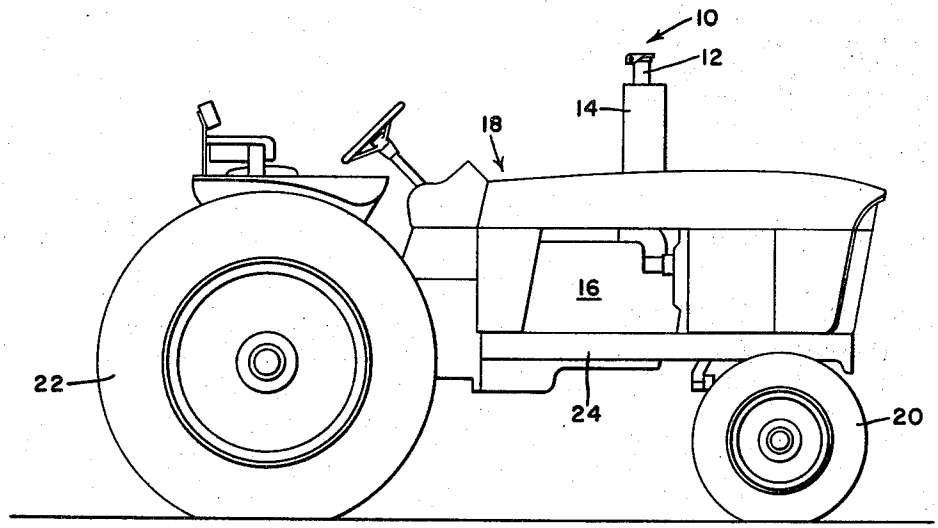


FIG. 1

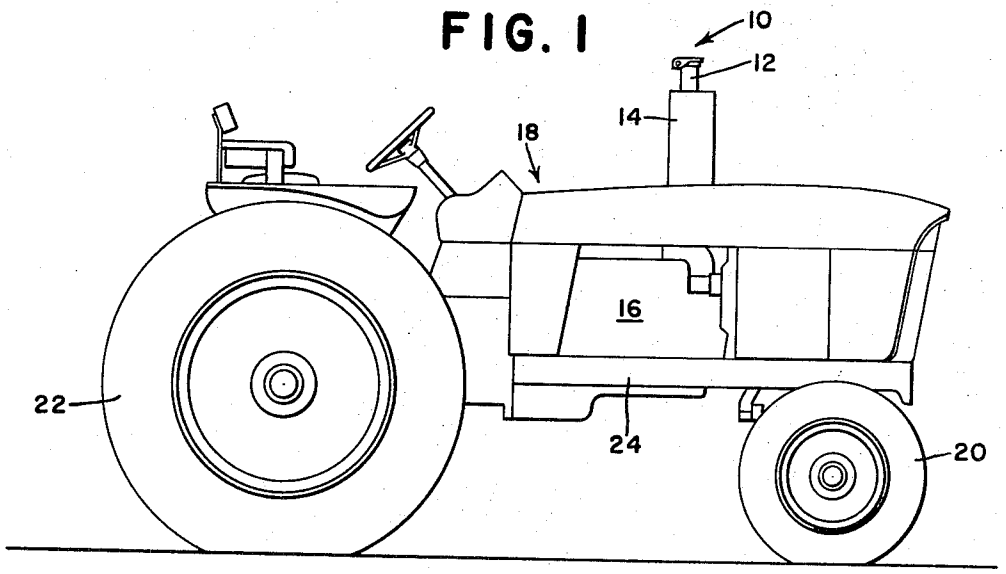


FIG. 2

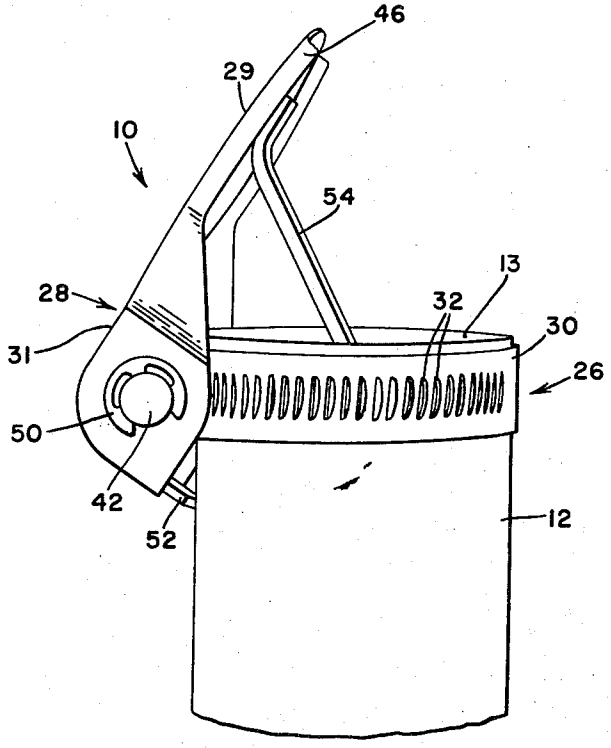


FIG. 3

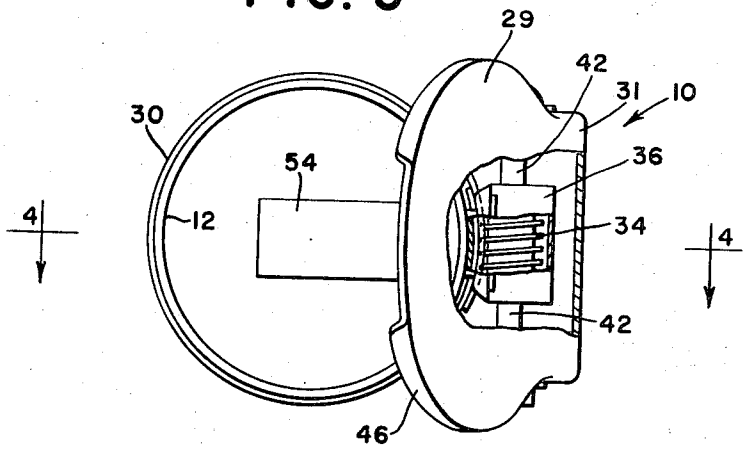


FIG. 4

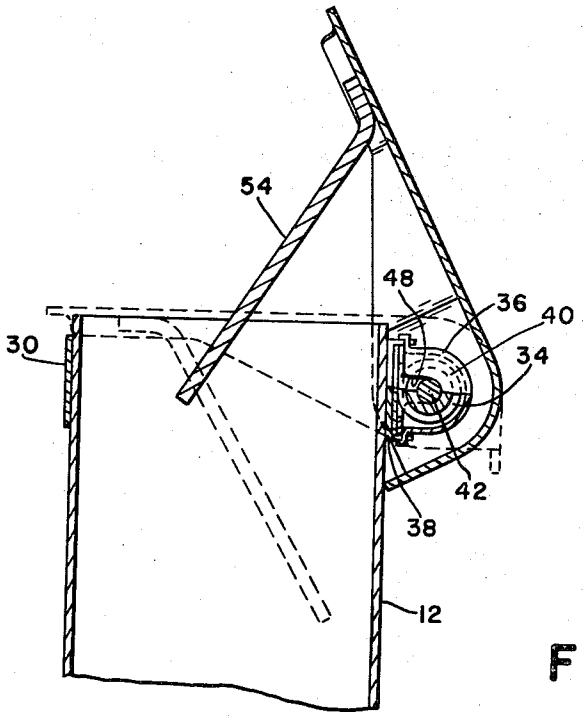
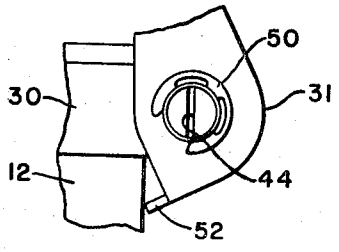


FIG. 5



WEATHER CAP FOR EXHAUST PIPE

BACKGROUND OF THE INVENTION

This invention relates to weather caps and more particularly relates to a pivotal weather cap for an upstanding exhaust pipe such as used on tractors.

Numerous pivotal weather caps for upstanding exhaust pipes have been devised to prevent the entrance of the elements into the interior of the exhaust pipe when the engine has been stopped. This type of weather cap generally includes a clamping member in pressure engagement with the outer wall of the exhaust pipe adjacent the upper end thereof. Pivotally attached about a substantially horizontal axis to the clamping member is a cover member which seats on the upper edge of the exhaust pipe to close the exhaust port when the engine is stopped. When the engine is started, the pressure created by gases within the exhaust pipe pivots the cover member upwardly to permit escapage of the gases. Presently used devices, however, are not wholly satisfactory in operation.

A first shortcoming is the nonadaptability of one universal weather cap to different size exhaust pipes. Upright exhaust pipes are used in a multitude of vehicles ranging from small tractors of the lawn and garden variety to the extremely large four-wheel drive articulated agricultural tractors. The outer diameter of exhaust pipes used on these vehicles becomes progressively larger as the size of the tractor increases. The clamping member of presently used devices is normally of split-ring construction having aligned ears through which a cap bolt passes. A nut threaded to the bolt draws the split-ring into engagement with the outer wall of the pipe. Since each split-ring clamping member has a particular inner diameter to correspond to the outer diameter of a certain size exhaust pipe, numerous size split-rings must be manufactured to accommodate the various size exhaust pipes used. Each size split-ring requires separate tooling and production equipment, thus increasing the cost of the weather cap.

A second shortcoming is the fact that normally the cover member is pivotally connected to the clamping member at a point opposite the cap bolt which secures the clamping member to the exhaust pipe. This separate pivotal connection requires additional cost in tooling and manufacturing.

A third shortcoming is the fact that on presently used devices, the cap bolts, nuts and pivoting rods are exposed. Since the tractors are often left in the field, these exposed parts are subjected to corrosion and rust caused by the elements. Once the parts have become inhabited with rust, the pivotal movement is impeded and the weather cap fails to work properly. Also, when the cap bolt and nuts are rusted, removal of the weather cap for replacement is rendered more difficult.

A fourth shortcoming lies in the fact that on most presently used devices a counterbalance is secured to the cover member in such a way that it aids in the lifting of the device which obviously makes it easier for the wind to lift the device such as in a rain storm and to permit moisture to enter the interior of the pipe thus defeating the purpose of the weather cap. Some weather caps have a counterbalance such as taught in U. S. Pat. No. 2,463,662 which aids in the closing of the cover member. However, the counterbalance is affixed

to the clamping member by a rather elaborate mechanism consisting of a bell crank lever having one leg which carries the counterbalance and a second leg which engages an arm connected to the cover flap. In addition to being expensive to manufacture, the pivoting mechanism is exposed to the atmosphere and susceptible to rusting which impedes the pivotal movement of the crank and prevents proper operation of the weather cap.

SUMMARY OF THE INVENTION

Generally, the weather cap of this invention comprises a cover flap pivotally attached to a flexible band which is wrapped around the upper end of the exhaust pipe and held in pressure engagement therewith by means of a worm carried on one end of the flexible band and meshing with a plurality of transverse slots carried by the opposite end of the band. The flap is pivotally connected to the flexible band by means of stub shafts projecting outwardly from opposite ends of the worm. A counterweight carried by the underside of the cover flap aids in the closing of the flap.

It is an object of this invention to present a weather cap for an upstanding exhaust pipe which has a common element for pivotally attaching a cover member to a clamping member and for securing the clamping member to the upper end of the exhaust pipe.

It is a second object of this invention to present a weather cap for an upstanding exhaust pipe which has universal application and which is constructed such that one weather cap can be adapted to exhaust pipes of varying diameters, thereby reducing the manufacturing costs of the weather cap and also reducing the inventory required by a retailer.

It is a further object of this invention to present a weather cap for an upstanding exhaust pipe wherein a worm is used to secure the cap to the outer wall of the exhaust pipe and wherein the worm is protected from the elements to prevent rusting and corrosion of the worm.

These and other objects of the invention will become more apparent from a consideration of the following Description of the Preferred Embodiment taken in accordance with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of an argicultural tractor having an upright exhaust pipe to which the weather cap of this invention is secured.

FIG. 2 is an enlarged side view of the weather cap of this invention showing the cover flap in the open position.

FIG. 3 is a top view of the weather cap of this invention having a portion of the flap member cut away to show the clamp securing worm.

FIG. 4 is a cut-away side view of the weather cap of this invention.

FIG. 5 is a partial side view of the weather cap of this invention showing the end of one of the extension shafts carried by and integral with the worm.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to FIG. 1, the weather cap 10 of this invention is shown mounted on the upper end of an upstanding exhaust pipe 12. Exhaust pipe 12 receives gases discharged from a muffler 14 which is connected

to the manifold of an internal combustion engine **16** in the conventional manner. The internal combustion engine **16** is the motivating force for a conventional tractor **18** having front wheels **20** and rear wheels **22** which support a frame **24** on which the engine **16** is mounted.

Referring now to FIGS. **2** and **3**, the weather cap **10** of this invention includes a clamping member **26** to which is pivotally attached a cover flap **28.** Clamping member **26** includes a flexible band **30** wrapped around the outer wall of exhaust pipe **12** adjacent the outlet port **13** thereof. A plurality of transverse slots **32** are stamped in band **30** in registered alignment and along the longitudinal length of the band adjacent one end thereof. The opposite end of band **30** rotatably carries a worm **34** enclosed in a worm housing **36.** As can be seen in FIG. **4**, worm housing **36** is U-shaped in cross section and is secured to band **30** by suitable means such as by a base plate **38** which is bonded to the underside of nonslotted end of band **30.** Worm housing **36** has end members **40** which are suitably notched to rotatably carry worm **34** and to accommodate the passage of the slotted portion of band **30** between the worm **34** and the nonslotted end of the band. Worm **34** meshes with slots **32** such that rotation of the worm causes movement of the slotted portion of the band relative to the other portion.

Worm **34** carries on each end, as an integral part thereof, outwardly projecting coaxial shaft extension members **42,** the outward end of at least one of these shaft extension members includes means for accepting a tool for inducing rotary movement of the worm. For example, one of the ends may contain a transverse groove **44,** such as shown in FIG. **5** for accommodating a screwdriver.

To clamp the weather cap to the exhaust pipe, worm **34** is rotated in the direction which advances the slotted portion of the band to draw the band **30** into pressure engagement with the outer wall of the pipe **12.** Band **30** preferably is of the same material as the pipe so that both the exhaust pipe and the band will expand and contract at the same rate in response to temperature variances. From the foregoing it can be seen that rotation of worm **34** also varies the diameter of the band, thus enabling the band to be fitted on different diametered exhaust pipes. The amount of capable variation depends only on the length of the band and the number of slots along the length thereof. Also, it will be appreciated that the securing of the band to the pipe is an extremely simple procedure requiring the use of a mere screwdriver to rotate the worm rather than requiring both a tool for holding the head of a cap bolt to prevent rotation and a second tool for turning a nut onto the cap bolt as is required in split-ring devices.

It will be further appreciated that when the flexible band **30** has been securely drawn around the outer wall of the exhaust pipe, the meshing of the slots with the worm prevents accidental or unintentional withdrawing or loosening of the cap since when not being rotated, worm **34** bears against the straight edge of the slots **32.**

Turning attention now in particular to cover flap **28,** the forward portion **29** thereof is flat and has a general circular contour as can be seen in FIG. **3.** The diameter of this portion of the cover flap is at least as large as the largest exhaust pipe on which the weather cap is to be employed. A marginal flange **46** depends around the perimeter of the forward portion **29.** The Flange **46** forms a lip around the upper end of the exhaust pipe with the underside of the forward portion **29** seating against the upper end of the pipe.

Tail portion **31** of the weather cap is in the shape of an inverted scoop which merges with the forward flat portion of the cover flap and forms a sheath for worm **34** and worm housing **36.** Thus worm **34** has a double covering to protect it from the elements and to assure proper operation thereof.

The opposing walls of the inverted scoop-shaped rear portion **31** have registered aligned apertures **48** which receive the shaft extension member **42** extending outwardly from the worm **34,** thereby providing for pivotal movement to the cover flap. Suitable retainer rings **50** fit into annular grooves on each of the stub shafts to prevent horizontal movement of the cover flap. The remaining wall of the tail portion has projecting therefrom a tab extension **52** which when the cover lid is in the upright position, bears against the outer wall of the pipe to limit the upward mobility of the cover flap.

Secured to the underside of forward portion **29** of the cover flap **28** is a downwardly projecting counterweight **54.** Counterweight **54** is suitably secured to the underside of the cover flap such as by bending the upper end thereof to present a sufficient contact area between the weight and the underside of the cover flap for bonding. Counterweight **54** depends into the interior of the exhaust pipe at an angle such that it does not touch the interior wall of exhaust pipe **12** when cover flap **28** is in the normally closed position as is shown dotted in FIG. **4.** It is to be also noted that the counterweight has no pivoting or moving parts which can wear out or rust and defeat the purpose of the weather cap. It is evident that with counterweight **54** so positioned on the forward end of the cover flap it will create a downward moment force which aids in the closing of the flap and once the flap is closed, in retaining the flap in the closed position. This is particularly helpful in rain storms wherein the wind has a tendency to lift the weather cap upwardly and permit moisture to enter the pipe. The downwardly directed force produced by the counterweight opposes this upward lifting force of the wind. It has been found in practice, also, that such placing of the counterweight on the forward portion of the cover flap has the further advantage of controlling cover flutter, that is, the oscillating of the cover flap caused by undulations in the pressure of the gas escaping through the exhaust port of pipe **12.**

In operation, weather cap **10** is affixed to the upper end of exhaust pipe **12** by simply drawing flexible band **30** into tight engagement with the pipe as has previously been discussed. When the internal combustion engine is shut off and there is no gas pressure within the interior of the exhaust pipe, cover flap **28** assumes its normally closed position with the underside of forward portion **29** seating against the upper edge of exhaust pipe **12** as is shown dotted in FIG. **4.** When the engine is started, gas pressure created within the interior of the exhaust pipe forces cover flap **28** upwardly until tab extension **52** bears against the outer wall of the exhaust pipe **12** to prevent further upward movement of the cover flap. With cover flap **28** in its open position, the gases escape through the outlet port of the exhaust pipe, and maintain the cover flap in the open position. When the engine is stopped, the gas pressure ceases and cover flap **28** pivots downwardly into its closed

position to prevent the entrance of the elements within the interior of the pipe.

While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the appended claims.

We claim:

1. An apparatus for covering the outlet port of an exhaust pipe of an internal combustion engine comprising:

a. a clamping member having

1. a flexible band surrounding the exhaust pipe adjacent the outlet port thereof and having a portion which possesses a plurality of aligned slots along the length thereof;

2. a worm rotatably attached about a substantially horizontal axis to said flexible band and operably meshing with the slots on said band such that upon rotation of the worm in one direction, the perimeter of the band is drawn into pressure engagement with the outer wall of the exhaust pipe and upon rotation in the opposite direction, the band is disengaged from the outer wall of the exhaust pipe and whereby rotation of the worm varies the perimeter of the band to adapt the band to exhaust pipes having different outer diameters; said worm having on each end outwardly projecting shaft extension members; and

b. a cover flap having a perimeter at least as large as the perimeter of the exhaust pipe and seatable in a normally closed position on the upper end of the exhaust pipe to cover said exhaust pipe; said cover flap being pivotally received about a horizontal axis on said shaft extension members whereby said worm and shaft extension members provide both a pivotal surface for the cover flap and a means for engaging the band to the exhaust pipe.

2. An apparatus as in claim 1 wherein said cover flap includes a marginal flange depending downwardly from the periphery thereof and adapted to surround the upper end of the exhaust pipe.

3. An apparatus as in claim 1 wherein said cover flap covers said worm to protect the worm from the elements.

4. An apparatus as in claim 1 including a counterweight affixed to said cover flap to facilitate the downward pivotal movement of the cover flap.

5. An apparatus as in claim 4 wherein said counterweight is affixed to the underside of said cover flap and depends therefrom into the interior of the exhaust pipe when the cover flap is in the closed position.

6. An apparatus as in claim 1 wherein at least one of said shaft extension members has thereon means for receiving a tool for causing rotative movement of said worm.

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