(54) Title: A FLOW THROUGH COVER ASSEMBLY

(57) Abstract

An electric wheel motor and cover assembly (10) mounted within a wheel hub (11) carrying a tyre (12), the hub includes a shroud section (13) with the assembly holding an electric motor illustrated in phantom at (14). Cooling air is delivered through the centre of the electric wheel and is vented through a cover (15). The cover (15) has side vents (16) on opposite sides of the cover (15). The cover (15) is made of a flexible bag (19) having an outer surface (17) bulging outward by reason of the application of the cooling air onto the interior of the cover (15). The cover (15) is made from three parts, a metal ring (18), a flexible bag (19) and a shaping ring (20) fitted to the inside of the bag. The bag (19) can be made from separate replaceable parts so that if one part is damaged the damaged part only need be replaced.
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A FLOW THROUGH COVER ASSEMBLY

FIELD OF THE INVENTION

This invention relates to a flow through cover assembly and in particular but not limited to an electric wheel motor cover suitable for use in an assembly of the type typically employed on earth moving equipment and dump trucks particularly when used in conjunction with front end loaders.

BACKGROUND TO THE INVENTION

Front end loaders and dump trucks frequently employ air cooled electric wheel motors. The motor is mounted coaxially with the wheel hub and cooling air flows through the motor and is vented through a cover employed over a projecting shroud within the wheel hub. Present covers are frequently damaged by collisions with other vehicles. This occurs particularly in the case of a front loader delivering material into a dump truck. Typically the tyres of the front loader collide with the wheel cover during loading. Consequently, it is necessary to replace or repair the cover.

OUTLINE OF THE INVENTION

It is an object of the present invention to overcome this problem by providing a resilient or flexible cover that is able to deform in response to collisions and do so without breaking.

In one aspect there is provided a flow through cover assembly having an outer surface, a side wall, attachment means and vent means, the assembly being so dimensioned and arranged that upon attachment to a source of gas under pressure the cover inflates. Typically the side wall employs at least in part a flexible ring and the outer surface is at least in part a flexible disk removably securable to the flexible ring. The ring and disk are preferably made in whole or in part from fabric.

In one embodiment the outer surface and side wall of the cover is made from a single unit.

In another embodiment the cover is made from replaceable parts so that if one part is damaged the damaged part only need be replaced. Typically, the side wall and outer surface are separate parts operatively secured together.
Preferably, the side wall is flexible and has a rigid shape defining ring adjacent the outer surface.

Preferably, the side wall is flexible and the attachment means includes a rigid ring coupled to the side wall opposite the outer surface. The rigid attachment ring having a peripheral shoulder and preferably operates in conjunction with a flexible strap, the side wall having an inner periphery surrounding an opening in the side wall, the strap being adapted to bias the periphery of the opening against the ring and behind the shoulder so that as the strap is tightened the strap secures the periphery of the side wall around the ring inside the shoulder thereby securing the side wall to the ring.

It is preferable that the cover has an outer fabric section that can deform on collision but then be restored to its original shape by reason of the action of the cooling air pressure on the inside of the cover.

In one preferred aspect therefore the present invention resides in an electric wheel motor cover having an outer surface and a side wall depending inwardly from the periphery of the outer surface, the side wall having wheel motor shroud attachment means enabling the side wall to be securely fitted to a wheel motor shroud adjacent a wheel hub housing the electric wheel motor and the cover having vent means to enable cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact.

The cover can be made from as single unit or can be made from replaceable parts so that if one part is damaged the damaged part only need be replaced. Typically, the side wall and outer surface are made from separate parts. Preferably, the side wall employs at least in part a flexible ring and the outer surface is at least in part a flexible disk removably securable to the flexible ring. The ring and disk are preferably made from a woven fabric, although plastics or other functionally equivalent materials may be used.

In another aspect the invention resides in an electric wheel motor and cover assembly, the assembly comprising a hub, a housing having an electric wheel motor, a source of air, air flowing from the source of air through the motor and being vented through the cover, a motor cover attachment means projecting from
the housing, the electric wheel motor cover comprising a flexible bag having vent means and a housing attachment means holding the bag in operative position secured to the motor cover attachment means, the housing attachment means comprising a rigid ring securing the bag in operative position by clamp means bridging between the ring and the motor cover attachment means.

Preferably the side wall of the bag is flexible and has a rigid shape defining ring spaced outwardly from the housing attachment means.

The housing attachment ring preferably operates in conjunction with a flexible strap surrounding an opening in the bag, the strap being adapted to bias the periphery of the opening in the bag against the ring and behind a shoulder so that as the strap is tightened the strap secures the periphery of the bag around the ring inside the shoulder thereby securing the bag to the ring.

**BRIEF DESCRIPTION OF THE DRAWINGS**

In order that the present invention can be more readily understood and be put into practical effect reference will now be made to the accompanying drawings which illustrate preferred embodiments of the invention and wherein:

Figure 1 is a drawing illustrating an electric wheel motor and cover assembly according to the teachings of the present invention;

Figure 2 is a cut away drawing of a typical cover;

Figure 3 is a cut away drawing similar to Figure 2 but showing an alternative embodiment of the present invention;

Figures 4 and 5 are drawings illustrating typical over-centre fasteners and ring configurations according to preferred embodiments of the present invention;

Figure 6 is a drawing illustrating a typical flexible strap locking means employing hook and loop type fasteners;

Figure 7 is an exploded side view illustrating another embodiment of the present invention cutaway in part to show concealed structure; and

Figure 8 is a perspective view of the embodiment of Figure 7 cutaway in part to show concealed structure.
METHOD OF PERFORMANCE

Referring to the drawings and initially to Figure 1 there is illustrated an electric wheel motor and cover assembly 10 mounted within a wheel hub 11 carrying a tyre 12, the hub includes a shroud section 13 with the assembly holding an electric wheel motor illustrated in phantom at 14. Cooling air is delivered through the centre of the electric wheel motor and is vented through a cover 15. The cover 15 has side vents 16 on opposite sides of the cover. In the illustrated embodiment the cover is made from a flexible bag having an outer surface 17 bulging outward by reason of the application of the cooling air onto the interior of the cover 15. The cover 15 in this embodiment is made from three parts, a metal ring 18, a flexible bag 19 and a shaping ring 20 fitted to the inside of the bag to accord the shape illustrated in Figure 1. The bag 19 includes a hemmed peripheral pocket 21 defining an opening which holds a strap that can be tightened around the ring 18 and locked in position using a locking means illustrated at 22.

These aspects of the invention will be described in more detail in the following drawings.

Figure 2 illustrates one form of cover at 30. In this embodiment a ring 31 is secured to the wheel motor shroud 13 using spaced over-centre fasteners 32 placed in this case at quarter spacing around the ring 31. Handles on opposite sides of the ring at 33 are used to initially position the ring 31 over the shroud of the wheel hub and the ring 31 serves as an adaptor since it carries fittings that effectively are adaptable to fit to the already existing wheels and in this sense the ring 31 serves as an adaptor to adapt the flexible bag to be secured as an alternative to the prior art fibreglass and plastics wheel covers.

The ring 31 has a projection or bead 33 and on the opposite side 34 so that it is generally dumbbell shaped in profile. As can be seen the bag in this embodiment 35 holds a circular rod 36 and has a strap 37 fitted within a pocket so that the strap 37 can tighten the bag 35 effectively behind the projection 34 in order to secure the bag 35 to the ring 31 after the ring 31 has been secured to the shroud.

The embodiment of Figure 3 is identical to the embodiment of Figure 2 except the over-centre clamps are on the inside of the ring as are the handles. In
the embodiment of Figure 3 the ring can be fitted in position before the bag is
attached except in the embodiment of Figure 3 once the bag is attached to the ring
there are no visible external fittings except for the locking means at 38.

Figures 4 and 5 illustrate the rings 18 and 31 in more detail and show
the pocket 21 and the strap 37 located behind the projection 34, the locking means
22, 38 is illustrated in its open position in Figure 6 and comprises two overlaying
flaps 39 and 40 hinged to the bag on opposite sides of the pocket 21. The pocket
21 has a gap in its outside surface defined between edges 41 and 42, the strap 37
is exposed and has attached to it a section of loop fastener at 43. As can be seen,
the strap can be pulled tight, the flap 39 has hook fasteners on its surface at 44 and
loop fasteners on its opposite side at 45. The flap 40 has hook fasteners at 46.
Once the strap 37 is pulled into its tight position behind the shoulder formed by the
projection 34, the flap 39 can be pushed into position so that the hook and loop
fasteners at 43 and 44 engage and then the flap 40 can be swung into position so
that the hook and loop fasteners 45 and 46 engage thereby locking the whole
assembly together and retaining the bag in operative position on the ring 31, 18.

Figures 7 and 8 illustrate a second embodiment of the invention that differs
from the previously described embodiment primarily in so far as it employs a
detachable outer surface, that is, the flexible cover is made from two parts rather
than a single part, it will however be appreciated that this is still within the ambit
of the present invention and where appropriate like numerals have been used to
refer to like features having regard to the previous embodiment. It will more
particularly be appreciated that the embodiments all have the element of being able
to flex under impact on the outer surface notwithstanding that the outer surface and
side wall may be made from different materials. For example, in some
circumstances it may be desirable to make the outer surface from lightweight rigid
material, thus relying on the flexing of the side wall on impact. However, in most
cases the outer surface is flexible fabric.

As can be seen the metal ring 31 is employed as before although the over
centre clips are not shown, these can be used or any other suitable fastener. In this
case a fabric ring 47 is employed. The fabric ring 47 has a hem or flange 48 holding
a strap 49, opposite ends of the strap 49 are held by a tensioning buckle 50 used to secure the fabric ring 47 to the metal ring 31 inboard of the bead 34. An outer fabric cover 51 is removably secured to the fabric ring 47 to form a bag 52 to basically the same shape and operative structure as the bag of the previous embodiment. A circular rod 36 is again employed to give the bag shape. The circular rod 36 is retained by velcro clips 53 although other fasteners may be used. The fabric cover 52 and fabric ring 47 have cooperating velcro fasteners at 54 and 55 although a zip fastener may be used as an alternative, other suitable fasteners may be used. The bag is vented as before with vents at 56 and 57 in the fabric ring 47.

Whilst the above has been given by way of illustrative example of the present invention many variations and modifications thereto will be apparent to those skilled in the art without departing from the broad ambit and scope of the invention as set out in the claims.
CLAIMS

1. A flow through cover assembly having an outer surface, a side wall, attachment means and vent means, the assembly being so dimensioned and arranged that upon attachment to a source of gas under pressure the cover inflates.

2. A flow through cover assembly according to claim 1 wherein the outer surface and side wall of the cover is made from a single unit.

3. A flow through cover assembly according to claim 1 wherein the cover is made from replaceable parts so that if one part is damaged the damaged part only need be replaced.

4. A flow through cover assembly according to claim 1 wherein the side wall and outer surface are separate parts operatively secured together.

5. A flow through cover assembly according to claim 1 wherein the side wall employs at least in part a flexible ring and the outer surface is at least in part a flexible disk removably securable to the flexible ring.

6. A flow through cover assembly according to claim 1 wherein the side wall employs at least in part a flexible ring and the outer surface is at least in part a flexible disk removably securable to the flexible ring, the ring and disk being made in part from fabric.

7. A flow through cover assembly according to claim 1 wherein the side wall is flexible and has a rigid shape defining ring adjacent the outer surface.

8. A flow through cover assembly according to claim 1 wherein the side wall is flexible and the attachment means includes a rigid ring coupled to the side wall opposite the outer surface.

9. A flow through cover assembly according to claim 1 wherein the side wall and outer surface are separate parts and the attachment means includes a rigid ring coupled to the side wall opposite the outer surface.

10. A flow through cover assembly according to claim 1 when used as an electric wheel motor cover venting cooling air, the wheel motor being axially positioned relative to a wheel motor shroud, the outer surface of the cover being axially disposed downstream of the motor and the side wall depending inwardly from a periphery of the outer surface, the side wall having wheel motor shroud
attachment means enabling the side wall to be securely fitted to the wheel motor shroud adjacent a wheel hub housing the electric wheel motor and the vent means to enabling cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact on the outer surface.

11. A flow through cover assembly according to claim 1 when used as an electric wheel motor cover venting cooling air, the wheel motor being axially positioned relative to a wheel motor shroud, the outer surface of the cover being axially disposed downstream of the motor and the side wall depending inwardly from a periphery of the outer surface, the side wall having wheel motor shroud attachment means enabling the side wall to be securely fitted to the wheel motor shroud adjacent a wheel hub housing the electric wheel motor and the vent means to enabling cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact on the outer surface, the outer surface and side wall of the cover being made from a single unit.

12. A flow through cover assembly according to claim 1 when used as an electric wheel motor cover venting cooling air, the wheel motor being axially positioned relative to a wheel motor shroud, the outer surface of the cover being axially disposed downstream of the motor and the side wall depending inwardly from a periphery of the outer surface, the side wall having wheel motor shroud attachment means enabling the side wall to be securely fitted to the wheel motor shroud adjacent a wheel hub housing the electric wheel motor and the vent means to enabling cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact on the outer surface, the cover being made from replaceable parts so that if one part is damaged the damaged part only need be replaced.

13. A flow through cover assembly according to claim 1 when used as an electric wheel motor cover venting cooling air, the wheel motor being axially positioned relative to a wheel motor shroud, the outer surface of the cover being axially disposed downstream of the motor and the side wall depending inwardly from a periphery of the outer surface, the side wall having wheel motor shroud attachment means enabling the side wall to be securely fitted to the wheel motor
shroud adjacent a wheel hub housing the electric wheel motor and the vent means
to enabling cooling air to be vented through the cover, the cover being able to
flexibly deflect in response to impact on the outer surface, the side wall and outer
surface being separate parts operatively secured together.

14. A flow through cover assembly according to claim 1 when used as an
electric wheel motor cover venting cooling air, the wheel motor being axially
positioned relative to a wheel motor shroud, the outer surface of the cover being
axially disposed downstream of the motor and the side wall depending inwardly
from a periphery of the outer surface, the side wall having wheel motor shroud
attachment means enabling the side wall to be securely fitted to the wheel motor
shroud adjacent a wheel hub housing the electric wheel motor and the vent means
to enabling cooling air to be vented through the cover, the cover being able to
flexibly deflect in response to impact on the outer surface, the side wall employs
at least in part a flexible ring and the outer surface is at least in part a flexible disk
removably securable to the flexible ring.

15. A flow through cover assembly according to claim 1 when used as an
electric wheel motor cover venting cooling air, the wheel motor being axially
positioned relative to a wheel motor shroud, the outer surface of the cover being
axially disposed downstream of the motor and the side wall depending inwardly
from a periphery of the outer surface, the side wall having wheel motor shroud
attachment means enabling the side wall to be securely fitted to the wheel motor
shroud adjacent a wheel hub housing the electric wheel motor and the vent means
to enabling cooling air to be vented through the cover, the cover being able to
flexibly deflect in response to impact on the outer surface, the side wall being
flexible and has a rigid shape defining ring adjacent the outer surface.

16. A flow through cover assembly according to claim 1 when used as an
electric wheel motor cover venting cooling air, the wheel motor being axially
positioned relative to a wheel motor shroud, the outer surface of the cover being
axially disposed downstream of the motor and the side wall depending inwardly
from a periphery of the outer surface, the side wall having wheel motor shroud
attachment means enabling the side wall to be securely fitted to the wheel motor
shroud adjacent a wheel hub housing the electric wheel motor and the vent means to enabling cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact on the outer surface, the side wall being flexible and the wheel motor shroud attachment means includes a rigid ring coupled to the side wall opposite the outer surface.

17. A flow through cover assembly according to claim 1 when used as an electric wheel motor cover venting cooling air, the wheel motor being axially positioned relative to a wheel motor shroud, the outer surface of the cover being axially disposed downstream of the motor and the side wall depending inwardly from a periphery of the outer surface, the side wall having wheel motor shroud attachment means enabling the side wall to be securely fitted to the wheel motor shroud adjacent a wheel hub housing the electric wheel motor and the vent means to enabling cooling air to be vented through the cover, the cover being able to flexibly deflect in response to impact on the outer surface, the side wall and outer surface being separate parts and the wheel motor shroud attachment means includes a rigid ring coupled to the side wall opposite the outer surface.

18. An electric wheel motor and cover assembly, the assembly comprising a hub, a housing having an electric wheel motor, a source of air, air flowing from the source of air through the motor and being vented through the cover, a motor cover attachment means projecting from the housing, the electric wheel motor cover able to flex under load having vent means and a housing attachment means holding the cover in operative position secured to the motor cover attachment means, the housing attachment means comprising a rigid ring securing the cover in operative position by clamp means bridging between the ring and the motor cover attachment means.

19. An electric wheel motor and cover assembly according to claim 18 wherein the side wall of the cover is flexible and has a rigid shape defining ring spaced outwardly from the housing attachment means.

20. An electric wheel motor and cover assembly according to claim 18 wherein the housing attachment ring operates in conjunction with a flexible strap surrounding an opening in the cover, the strap being adapted to bias the periphery
of the opening in the cover against the ring and behind a shoulder so that as the strap is tightened the strap secures the periphery of the cover around the ring inside the shoulder thereby securing the cover to the ring.

21. An electric wheel motor and cover assembly according to claim 18 wherein the cover is made from replaceable parts so that if one part is damaged the damaged part only need be replaced.

22. An electric wheel motor and cover assembly according to claim 18 wherein the side wall and outer surface are separate parts operatively secured together.

23. A flow through cover assembly according to claim 1 wherein the attachment means includes a rigid attachment ring having a peripheral shoulder, the attachment ring operating in conjunction with a flexible strap, the side wall having an inner periphery surrounding an opening in the side wall, the strap being adapted to bias the periphery of the opening against the attachment ring and behind the shoulder so that as the strap is tightened the strap secures the periphery of the side wall around the attachment ring inside the shoulder thereby securing the side wall to the attachment ring.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. 7: B60B 7/00; B60K 7/00, 11/06, 17/14; H02K 9/02, 15/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. 7: B60B 7/00; B60K 7/00, 11/06, 17/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Derwent World Patent Index

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 4658511 A (KAHLICH et al) 21 April 1987 Figure 1 and column 5 line 6 - column 6 line 43</td>
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Date of the actual completion of the international search
20 April 2000

Date of mailing of the international search report
8 May 2000

Name and mailing address of the ISA/AU
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
E-mail address: pct@ipaaustralia.gov.au
Facsimile No. (02) 6283 3929

Authorized officer
D.R. LUM
Telephone No: (02) 6283 2544

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### DOCUMENTS CONSIDERED TO BE RELEVANT

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