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To： CCS surveyors/auditors, ship owners and managers

Technical Information on Maintenance of Closing Appliances of Ventilators for Machinery Space

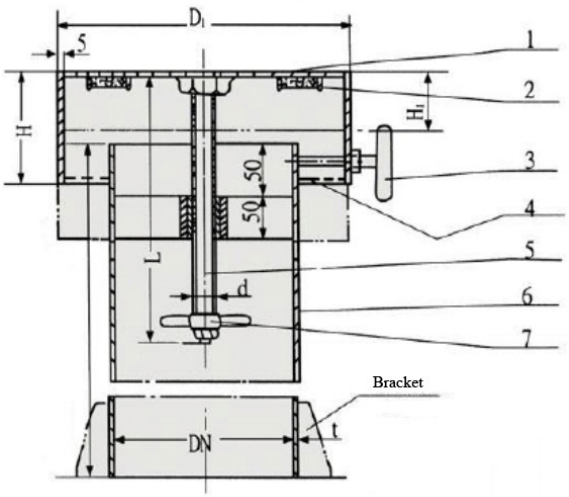
1 Preface

Deficiency related to closing appliances or fire dampers for ventilator is the most common one of the deficiencies found by port State control (PSC) inspections. According to the PSC reports from port State authorities, almost every year not a few of ships arriving at a port are detained due to such deficiencies. This technical information is made, with the aim of introducing everyone to the possible reasons which results in the abovementioned deficiency and of avoiding the recurrence of similar deficiencies.

2 Common types of closing appliances or fire dampers of ventilator for machinery space

Ventilator used on board a ship has many types, e.g. mushroom, hemisphere, trunk, gooseneck and recessed ventilators, etc., while machinery space ventilator usually adopts four models, shown as below (CB/T 295-2000):

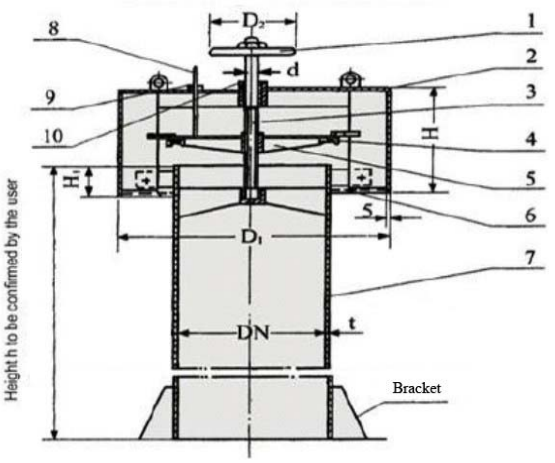
Structural configuration of Model A ventilator



Note: if height H of the air duct is more than 900mm distant from the deck, extra bracket is to be fitted.
1-wind cover; 2-sealing filler; 3- stop screw needle;
4-rodent-resistant net, insect screen (or flame screen)
5-screw rod; 6-air duct; 7-handle

Figure 1

Structural configuration of Model B ventilator



Note: if height H of the air duct is more than 900mm distant from the deck, extra bracket is to be fitted.
1-hand wheel; 2-wind cover; 3- screw rod; 4- sealing filler;
5-weathertight cover; 6-rodent-resistant net, insect screen (or flame screen)
7-air duct; 8-indicating stick; 9-casing; 10- forced filling oil cup

Figure 2

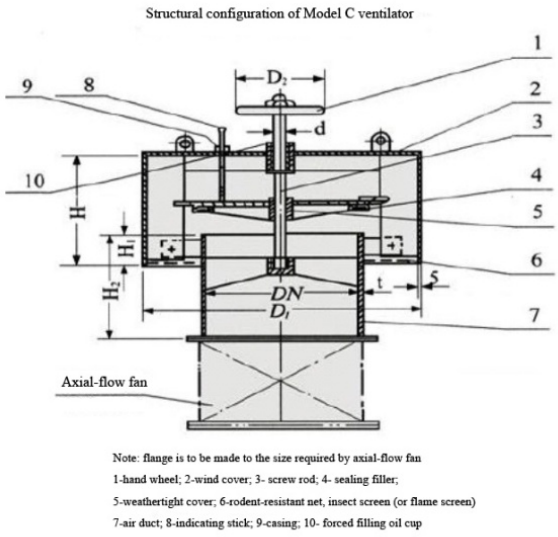


Figure 3

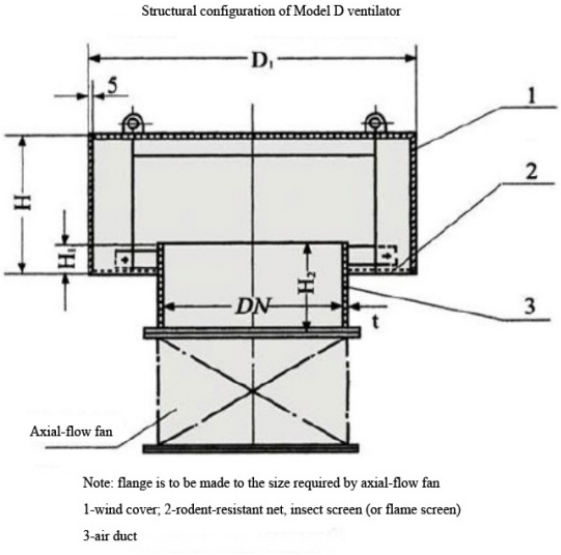


Figure 4

Figure 1 Model A ventilator: the ventilator heads goes up and down by rotation and when it drops down to the upper edge of the cylinder, it will be closed weathertight.

Figure 2 Model B ventilator: a hand wheel is fitted in the middle of the ventilator heads, by rotation of which the screw rod may drive the weathertight cover to go up and down for opening and closure of the ventilator.

Figure 3 Model C ventilator: the method for opening and closing the ventilator is same as the one of Model B, except only that it has an axial-flow fan inset into the middle of the cylinder.

Figure 4 Model D ventilator: it may be opened or closed by turning over the fire damper which is fitted in the middle of the cylinder.

Explanation: among the above four, Model A, B and C ventilators are able to meet the requirement for weathertight closure, while Model D are not, so that it cannot be used in the area of Position 1 and 2, as defined in Load Line Convention. Therefore, Model D ventilator is generally fitted in areas of the top of machinery space casings where there is no need to take into consideration the requirements for being weathertight in Load Line Convention, but those for fire prevention in SOLAS Convention only.

3 Requirements for the maintenance of machinery space ventilator

For the above four mushroom ventilators, attention to their maintenance and inspections varies with their different structural configurations. See details as follows:

1) Model A is usually used for a ventilator with a smaller diameter (DN150-350mm). Because arm of force of this model has more power at the time of shifting ventilator heads, it is not easy to stop screw rod and nut turning due to general corrosion or wastage. However, for the same reason, the rod may be bended by inappropriate force or damage and not work properly. So during maintenance, the ventilator heads is to be shifted up to a sufficient height to facilitate lubricating and maintaining, and its interior, the rod, the nut and sealing filler are to be examined.

2) Heads of Model B or C ventilator is fixed to cylinder by bolts or weld. At ordinary times, crew is to anoint/inject screw rod and nut with lubricating grease, and make them flexible during maintenance. Meanwhile, rotational flexibility of hand wheel is to be examined.

Sheathing is to be in place and this cannot be done by only one rotation or two. During an overhaul which is carried out in conjunction with a special survey or a shipyard visit of a ship, some chosen ventilators may be detached their ventilator heads from them to have an internal inspection, and attention is to be paid to corrosive conditions of both the upper edge of cylinder and weathertight cover. If problems are found, all the similar ventilators are to be required to dismantle for the inspection.

3) Fire damper of Model D ventilator is usually made of rounded thin steel or dampers. At its both ends there is a short axis which threads through a simple bearing on the cylinder, which is, by contrast, difficult to maintain and tends to have improper maintenance for a long period, so that the fire damper is easily corroded and distorted and in such event the closure will not be in place. During inspection, its flexibility and the shaft which cannot be too loose are to be concerned with. Lateral operating handle is to be required to dismantle for checking if it cannot reach the closing position indication (level) or any other abnormal issue happens.

4) It is to be noticed that the open-close direction of closing appliances or fire dampers for ventilator and the closing position indication of thereto are to be clear and intact. Because machinery space ventilator is always kept open and the chance for sheathing to go sufficiently down to the closing position only happens during inspection or testing, it is to place the sheathing in position when testing carries out.

5) For a ventilator adopting mechanical dampers or remote-controlled mechanical dampers or mechanical baffles, an operation test must be conducted during inspection and it must be confirmed that the ventilator is closed tightly.

6) For a ventilator with a fixed head, because there is usually a flame screen or a dust (insect) screen beneath its ventilator heads, internal structural members (e.g. the upper edge of the cylinder, weathertight cover, supporting structures of ventilator heads, and screw rod, etc.) may not be observed with ease. Therefore, in case of any questions to aged ships or during an outside inspection, the flame or dust screen can be required to remove for easy observation on the internals.

4 Typical structure and deficiencies of fire damper inside machinery space ventilator

Model D is the most usual type of a ventilator in machinery space and the ineffective closure of its inside fire damper often causes ship detentions by PSC. The following example for a typical fire damper of a Model D ventilator introduces its structure and common deficiencies:

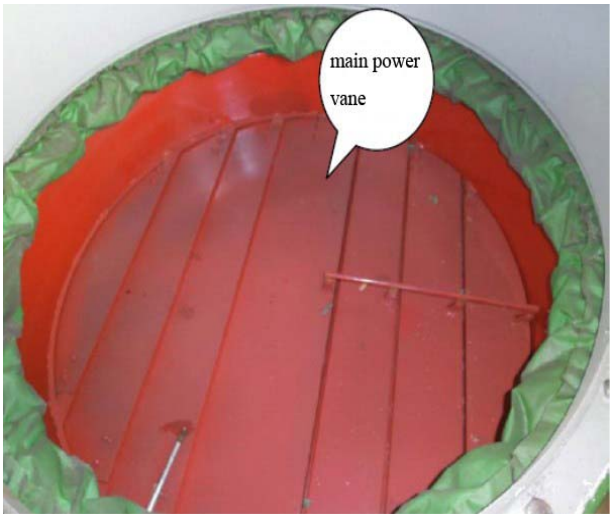


Figure 5: fire damper closed

Figure 6: fire damper opened

As shown in the above Figure 5 and 6, the fire damper consists of several vanes, among which the middle one is the main power vane. Initiated by remote controls situated outside the ventilator, the main power vane rotates and drives the side driven vanes via linkages to open and close the fire damper.

Primary reasons for malfunction of such fire damper:

- ✧ shaft of main power vane not flexible;
- ✧ bolts in connection with shaft and vane base loose, resulting in switch invalid and in driven vanes unable to rotate.
- ✧ as the type of the fire damper is generally fail-safe in design, deterioration of shaft and bolt is more likely to occur due to the long-term forces on them and the corrosion caused by damp air.

5 Recommendations on amendments to the ventilators in machinery spaces

Malfunction of the fire damper inside such ventilator will lead to the potential hazard of fire and the risk of PSC detentions. The key point to avoid this is the periodical maintenance of ventilators by crew. However, it is difficult to carry out the on-board maintenance for Model D ventilators because of its structure.

Figure 7

Figure 8

As shown in Figure 7 and 8, for inspection and maintenance to the active parts of the fire damper, all the bolts on the sides, top and bottom of the axial-flow fan must be dismantled to open the cylinder and the electrical machine and the impeller must be pulled out. This may be accomplished by spending more time in shipyard where various resources are sufficient, but for on-board dismantling by crew, is very difficult.

In order to facilitate crew's inspections and maintenance on the fire damper, for such ventilator with a large axial-flow fan, a sighting port for inspection and repair is advised to add to the fixed side of the cylinder, referring to Figure 9 and 10.

Figure 9

Figure 10

The sighting port is to be provided with a cover which is easily removed and can ensure fire integrity of the ventilator, and its opening size is to make it easier for crew to conduct the inspection and maintenance. Of course, ventilators produced under other standards which can meet the above requirements will also be accepted.

6 Key points for the inspection of machinery space ventilator are:

1) whether its coaming is corroded,
2) whether the stays and welds at the bottom of the coaming are corroded,
3) whether the flame(or insect) screen on its top is damaged,
4) whether the flame(or insect) screen and the edge of the coaming are in close contact,
5) whether its cover is corroded,
6) whether the operating handle of its fire dampers is corroded,
7) whether the switch and arrow marking on the coaming are clear,
8) whether the name of the corresponding fan is marked on the coaming,
9) whether the fire damper is easily observed from the coaming,
10) whether the fire damper inside the ventilator is corroded,
11) whether the operating handle of the fire dampers is flexible,
12) whether the remote controls for the fire dampers is effective.

With a view to the above, the Society reminds ship companies to enhance the maintenance of closing appliances for machinery space ventilator, and expects them to pay attention to it and take practical actions.

Surveyors/auditors of the Society are to carry out an examination to the test of the ventilator during survey/audit at ordinary times.

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