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A MECHANISM FOR AUTOMATIC AND MANUAL CONTROL OF THE AIR VELOCITY AT THE WINDOW OPENING OF FUME HOODS

by

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Definition of Purpose

The purpose of the following research concerned an effort to develop a control on the air velocity at the door opening of a fume hood. It was felt necessary that this control, acting through a damper, must maintain positive action and must be automatic as well as manual, and purely mechanical in nature. Considerations of the use of electrical or pneumatic devices in any portion of the mechanism were rejected in order to maintain as simple and direct a mechanism as possible avoiding as much maintenance and breakdown as could reasonably be foreseen.

Problems Involved

The first problem was that of developing a positive controlled velocity action through the face opening of the hood without causing turbulence or other air action sufficient to cause eddy currents, back drafts, etc. of such a nature as to provoke any danger from toxic or radio-active materials as regards the operator of the hood. It was felt that in order to safe guard against possible back drafts, eddy current, etc., it was necessary to develop a control mechanism to satisfy the following conditions:

The establishment of constant velocity through the face of the hood.

The development of a true automatic control to insure the above constant velocity at any position of the door of the hood.

To develop in addition the possibility of manual control to provide increased velocity when needed within the discretion of the operator of the hood.

The establishment of an emergency release of the door of the hood by the operator with the additional

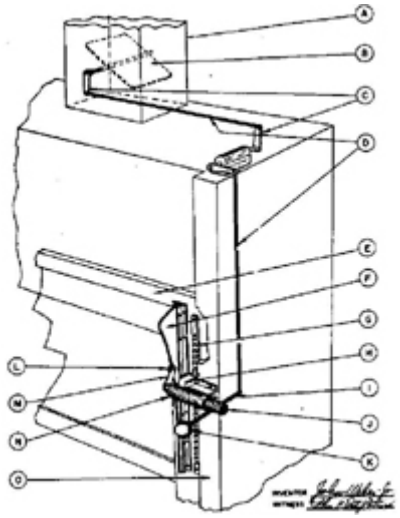
provision that the damper must be reset to automatic position before the operator can resume operation of the hood.

Development

As a first problem, it was felt necessary that direct linkages were necessary between the door of the hood and the damper.

In addition, it was also felt necessary to develop a condition in the mechanism whereby the sash could be operated, independent of the damper.

It was also felt expedient that under conditions whereby the mechanism is being used in manual operation, a looking device was necessary by which the sash could be moved in the direction of a closed position only in order to insure positive increasing velocity at a time. In connection with this, it was also considered necessary that the door of the hood could be closed rapidly by the operator as an emergency arose.



With the above conditions the relation between velocity and the door action depends upon the linear cam profile established. This is explained in the drawing. The position of the mechanism was also considered carefully and it was ultimately established on the right side of the face of the hood for operation in that position. In considering the material for the building of the mechanism, every effort was made to develop the various parts of the mechanism from standard turned stock eliminating any castings as far as possible. The weight of the mechanism is also a consideration as well as the fact that it must be resistant to corrosion actions of any sort. For this reason, stainless steel was chosen in the main.

The damper itself was designed to be inserted where the exhaust duct leaves the hood proper. As was mentioned above, direct linkages connect the damper and the control mechanism. The damper is designed as a unit and may be removed from the hood in a simple manner by a plate opening to which it is attached and fastened against the exhaust duct.

The considerations in this problem were restricted to a non-air-conditioned situation in the area in which such a good is to be used. In an additional investigation, the development of mechanism to be used under air conditioning will be considered.