the static efficiency with resulting low power consumption and noise levels. Smaller fans with higher outlet velocities may be used if the installation requirements are such as to warrant the additional power and increased sound level. When space for duct expansion from a fan outlet is not available there may be advantages in selecting a larger fan for reducing duct noises, although lower outlet velocities generally result in lower fan efficiencies which cannot always be justified on the basis of increased cost and space requirements. Fans for schools, churches, residences, and all public buildings should be selected for lower outlet velocities and tip speeds than would be required for other types of installations.

Having selected a fan for its quietest operating point consistent with the requirements of the installation, it must be recognized that ventilating fans, even so selected, emit noise and precautions must be taken in the installation of the fans to prevent this noise from being transmitted to occupied portions of the building. Fans operating against high static pressures produce more noise than fans operating against low static pressures. Consequently, from a noise standpoint, the system should be designed to operate against the lowest static pressure possible. In many modern air conditioning systems it is necessary to introduce devices into the air stream for conditioning the air in various ways, the result of which is to set up a rather high static pressure against which the fan must operate. In such cases the sound level at the fan may be too high to be neglected and special sound treatment of the installation must be considered. When a fan is operating against higher pressures it should be located in a room either removed from the occupied areas, or in a room which has been acoustically treated to prevent sound being carried through the walls to adjoining spaces. The fan should be mounted on a resilient base along with its driving motor to absorb any noise or vibration which might be transmitted to the floor and thence to the building structure. All ducts should be connected to fans with unpainted canvas, or other flexible material, to prevent any vibrations being transmitted to the duct work. Ducts leading into the fan room or from the fan should be acoustically treated on the interior and in special cases should be provided with sound traps or filters. Many ventilating systems encounter noises which are connected with the fan in no way. Noises due to high duct velocities, abrupt turns, grilles, etc., may be present. Treatment of such problems is covered in Chapter 42.

If double width, double inlet fans are selected, care must be taken that both inlets have the same free area. If one inlet of a fan is obstructed more than the other, the fan will not operate properly, as one half of the wheel will deliver more air than the other half. Proper installation and location of fans is as important as the selection of the size of fan for that particular installation. All fans will work according to their characteristic curves if they are properly selected and properly installed and operated.

FAN DESIGNATIONS

In order to prevent misunderstandings, which may cause delays and losses, the arrangements of fan drives adopted by the *National Association of Fan Manufacturers* and indicated in Fig. 5 are suggested.

Facing the driving side of the fan, blower, or blast wheel, if the proper direction of rotation is clockwise, the fan, blower, or blast wheel will be designated as *clockwise*. If the proper direction of rotation is counter-clockwise, the designation will be *counter-*

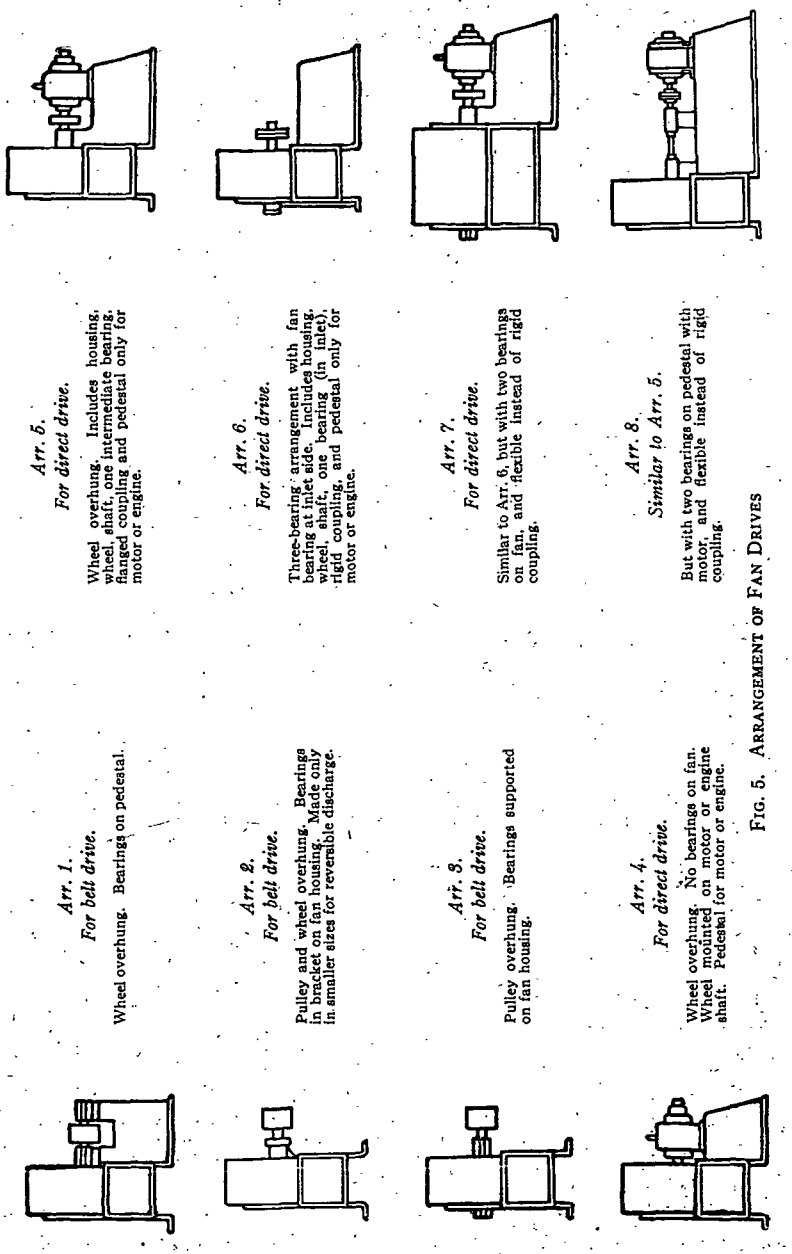


FIG. 5. ARRANGEMENT OF FAN DRIVES