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An Attempt to Eliminate Reverse Turns from Starting Winding of 2-Pole Hermetic Split-Phase Motor (1)(Abstract Only)

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AN ATTEMPT TO ELIMINATE REVERSE TURNS FROM STARTING WINDING OF 2-POLE HERMETIC SPLIT-PHASE MOTOR (1)

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ABSTRACT

An alternating current single phase two poles induction motor of the "Split-Phase" type, used in hermetic compressors, consists of main field winding and starting field winding, the two windings being displaced in space quadrature (ninety degrees apart) on the stator core. A great majority of these motors use commercially available current-relays for energizing the starting winding during starting and accelerating period and de-energizing it when a predetermined desired speed and torque levels are attained.

Most of these hermetic motors use protectors (external or internal) that are not able to respond to very high heating rate of starting winding, without having nuisance trips under running conditions. In such applications, mostly the starting winding uses some turns wound in the forward direction and some turns in the reverse direction, for the following reason: For a given main winding that results in desired running performances and that meets the requirements of pick-up of the current relay, the relay drop out should occur around a predetermined speed and torque level. The current through the main winding, during starting and accelerating conditions, is greatly influenced by the reactance of the starting winding. More specifically, larger the reactance of starting winding, higher the speed and lower the torque at which the relay will drop out. For this reason it is essential that the effective turns of this winding be substantially smaller compared to those in the main winding and since starting winding is formed of wire substantially smaller in diameter compared to that in the main winding, it may be subjected to high heating rate.

Both the reverse turns, used in the starting winding of prior art, and a major portion of equal number of forward turns can be omitted if the starting winding is shifted, suitably, in space in the same direction as the rotation of the motor. By shifting in space, an all forward turns winding out of quadrature with the main winding and connecting the two windings so that the shift occurs in the direction of rotation of the motor, the mutual leakage reactance of both the windings is increased resulting in the reduction of current in both windings, when energized together during starting and accelerating conditions.

The reduction of starting winding current keeps its heating rate to a desirable level whereas the reduction of main winding current allows the relay to drop out at desirable speed and torque levels.

The paper will report in detail, the test results of the motors built to varify the above. The paper will also discuss the limitations of the use of the above technique. Approximately 70% of the paper will be devoted to the discussion of the test results.

(1) Special Design Problems