This invention relates to an improved cone type compressor. In the Byram and Chang Patent No. 2,590,751, dated March 25, 1952, there is a general disclosure of pumps having relatively flat disc-like pumping elements wherein the pumping elements are provided with spiral threads and wherein one of the elements has one thread more than the other element.

In the Chang patent, No. 2,590,435, dated March 25, 1952, there is a more detailed disclosure of such pumps. In the last mentioned patent there were disclosed pumps having cone shaped, bowl shaped, or flared shaped pumping elements as well as flat pumping elements. In the Chang and Hagerman Patent No. 2,566,116, dated August 28, 1951, there is disclosed a machine for forming pumping elements for use with the relatively flat types of pumps and in my copending application, Serial No. 278,030, filed March 22, 1952, now Patent No. 2,720,130, dated October 11, 1955, there is disclosed a lathe having complex tool movement useful in the machining of a cone type compressor element, such as is used in a compressor according to my copending application, Serial No. 278,029, filed March 22, 1952, now Patent No. 2,733,854, dated February 7, 1956.

The principal object of the present invention is to provide a compressor of the cone type referred to in said last mentioned copending application having a stator of resilient or rubber-like material, and wherein the starting torque requirements are greatly reduced while the efficiency of the stator-rotor seal is maintained. Other objects of the invention include the provision of a compressor having all of the advantages mentioned in connection with the compressor of my said Patent No. 2,733,854, and without substantially increasing the cost thereof.

These and other objects of the invention which will be pointed out in greater detail hereinafter or which will be understood by one skilled in the art upon reading the specifications, I accomplish by that certain construction and arrangement of parts of which I shall now disclose certain exemplary embodiments.

Reference is made to the drawings forming a part hereof and in which:

Figure 1 is a longitudinal cross sectional view of one form of compressor according to the present invention.

Figure 2 is a fragmentary view similar to Figure 1 showing a modification.

Figure 3 is an elevational view, with parts broken away, of the compressor elements in another modification, and

Figure 4 is an axial cross sectional view through a stator representing a still further modification.

For details of the surfaces of the compressor elements, reference is hereby made to my said Patent No. 2,733,854, since the present invention is not in any way concerned with the details of the surfaces.

Briefly, in the practice of my invention I provide means whereby the larger end of the resilient stator at least and preferably about the larger half of the stator is protected from the discharge pressure so that only approximately the smaller half end of the stator is subject to the discharge pressure.

As pointed out in said last mentioned patent, the fact that the exterior of the resilient stator is subjected to discharge pressure enhances the stator-rotor seal and makes the compressor more efficient. I have found, however, that where the discharge pressure acts upon the entire stator as in my said last mentioned copending application, the frictional effect is such that the starting torque of the pump is greatly increased. I have found that if the larger end at least of the stator, and preferably about one-half at the larger end of the stator, is protected from discharge pressure, the starting load is greatly reduced while the sealing qualities are not adversely affected. I am thus enabled to produce a compressor which is just as efficient but it may be operated with a considerably smaller electric motor.

In Figure 1 I have shown a rotor or inner element 21 driven from a shaft 22 through a universal joint 20 and operating within a stator or outer element 2.

The compressor is housed within a casing element 24 having a separate head portion 25 carrying an inlet or suction port 26. A discharge port is provided in the member 24 at 27. The casing portion 24 and head 25 are held together by means of nuts and bolts, as generally indicated at 28, through flanges 28a on the member 24 and 28b on the member 25. The stator member 23 is provided with an annular flange 29 which is clamped between the flanges 28a and 28b.

The structure described is very similar to that disclosed in my said last mentioned patent. The difference lies in the fact that the annular stator flange 29 is substantially at the midpoint of the stator rather than at the large end and the head portion 25 is correspondingly lengthened to accommodate the large end of the stator.

It will be clear from a study of Figure 1 that only the upper end of the rotor is raised from the casing element 24, the discharge pressure within the casing element 24 and that the larger end of the stator is subjected to suction pressure. In this way, the frictional effect or binding effect between stator and rotor is eliminated in that region where it would do more harm than good and is thereby restrained in that region where its harmful effects are far outweighed by the beneficial sealing effect.

Similar results may be obtained with the structures illustrated in Figures 2, 3 and 4 and in other modifications which will be apparent to one skilled in the art. Thus, in Figure 2 the casing portion 24a is substantially like that in my said last mentioned copending application and likewise the head element 25a is similar. The head element 25a contains the suction port 26 and the sections 24a and 25a are held together by means of bolts 28c passing through the flanges 28a and 28b.

The rotor is indicated at 21a and the stator, which is also illustrated in Figure 4 is partially spaced from the casing element 24a, is indicated at 23a. The stator flange is indicated at 28a. It will be observed that the stator 23a with its flange 28a is similar to that disclosed in my said last mentioned patent. The larger end of the stator 23a is protected from the discharge pressure within the casing element 24a by a sleeve or shell 30 extending approximately half the length of the stator. The sleeve or shell 30 is bonded in any desired manner to the exterior of the stator and is of a material which is sufficiently rigid to prevent distortion of the larger end of the stator covered thereby by the discharge pressure.

In Figure 1 I have shown another modification where the rotor 21b operates within a stator 23b having a flange 29b and wherein the stator carries a shell 30a which is substantially like the shell 30 of Figure 2 over approxi-
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3. A compressor having one pair, at least, of cooperating conical pumping elements one within the other, said pumping elements having threads extending in a conical path, a casing enclosing said elements and spaced from the outer one of said pumping elements over a portion at least of its length, the outer one of said pair being of resilient material and being stationary and having means in contact with said casing and dividing said casing into a high pressure discharge and low pressure suction side, means for rotating the inner one of said elements, an inlet port in said casing adjacent the larger ends of said elements, one of said elements being mounted for nutational movement with respect to the other about a fixed point on which an extension of the conical threads of said member would converge, and in a sense opposite to the sense of rotation of said inner element, the larger end, at least, of said outer element being encased in a rigid shell to prevent its radial compression by said discharge pressure.

4. A compressor according to claim 3 wherein said outer element flange is disposed approximately midway between the ends of said stator.

5. A compressor having one pair, at least, of cooperating conical pumping elements one within the other, said pumping elements having threads extending in a conical path, a casing enclosing said elements and spaced from the outer one of said pumping elements over a portion at least of its length, the outer one of said pair being of resilient material and being stationary and having means in contact with said casing and dividing said casing into a high pressure discharge and low pressure suction side, means for rotating the inner one of said elements, an inlet port in said casing adjacent the larger ends of said elements, one of said elements being mounted for nutational movement with respect to the other about a fixed point on which an extension of the conical threads of said member would converge, and in a sense opposite to the sense of rotation of said inner element, the larger end, at least, of said outer element being encased in a rigid shell to prevent its radial compression by said discharge pressure.

6. A compressor according to claim 5 wherein said rigid shell covers substantially the larger one-half of said outer element.

7. A compressor having one pair, at least, of cooperating conical pumping elements one within the other, said pumping elements having threads in a conical path, a casing enclosing said elements and spaced from the outer one of said pumping elements over a portion at least of its length, the outer one of said pair being of resilient material and being stationary and having means in contact with said casing and dividing said casing into a high pressure discharge and low pressure suction side, means for rotating the inner one of said elements, an inlet port in said casing adjacent the larger ends of said elements, an outlet port in said casing adjacent the smaller ends of said elements, one of said elements being mounted for nutational movement with respect to the other about a fixed point on which an extension of the conical threads of said member would converge, and in a sense opposite to the sense of rotation of said inner element, the larger end, at least, of said outer element being encased in a rigid shell to prevent its radial compression by said discharge pressure.

8. A compressor according to claim 7 wherein said slots extend substantially one-half the length of said shell.

9. A compressor having one pair, at least, of cooperating conical pumping elements one within the other, said pumping elements having threads extending in a conical path, a casing enclosing said elements and spaced from the outer one of said pumping elements over a portion at least of its length, the outer one of said elements being of resilient material and being stationary and having means in contact with said casing and dividing said casing into a high pressure discharge and low pressure suction side, means for rotating the inner one of said elements, an inlet port in said casing adjacent the larger ends of said elements, an outlet port in said casing adjacent the smaller ends of said elements, one of said ele-
ments being mounted for nutational movement with respect to the other about a fixed point on which an extension of the conical threads of said member would converge, and in a sense opposite to the sense of rotation of said inner element, the larger end, at least, of said stator having reinforcing elements molded thereto, to prevent its radial compression by said discharge pressure.

10. A compressor according to claim 9 wherein said reinforcing elements extend substantially one-half the length of said stator.

References Cited in the file of this patent

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