Dec. 23, 1941. T. A. BOWERS 2,267,367

PISTON RING

Filed Aug. 3, 1939

Fig. 1.

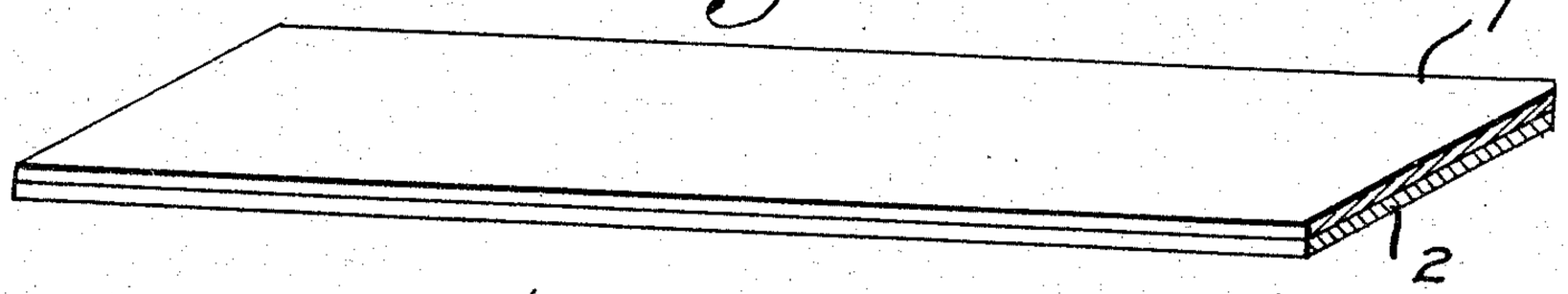


Fig. 3.

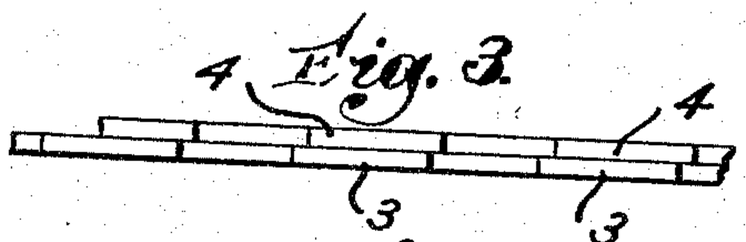


Fig. 2.

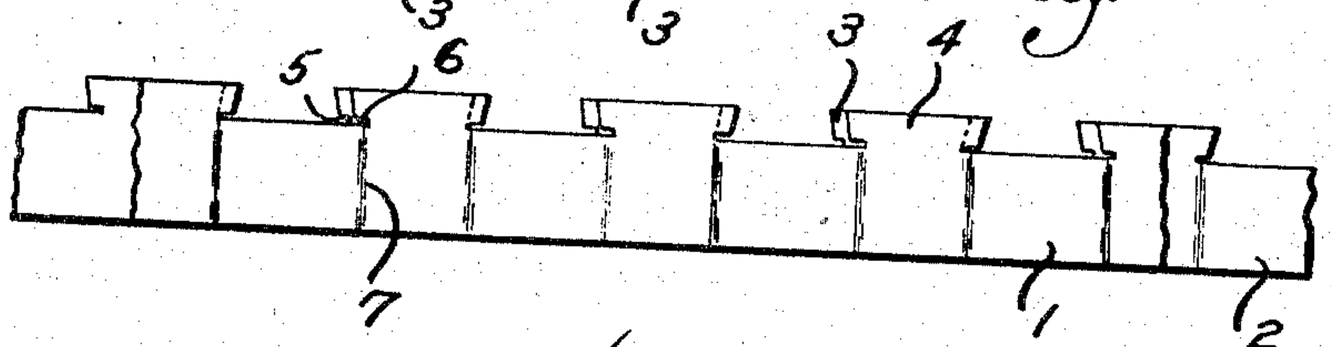


Fig. 4.

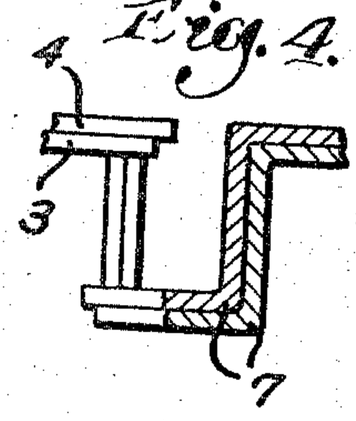


Fig. 5.

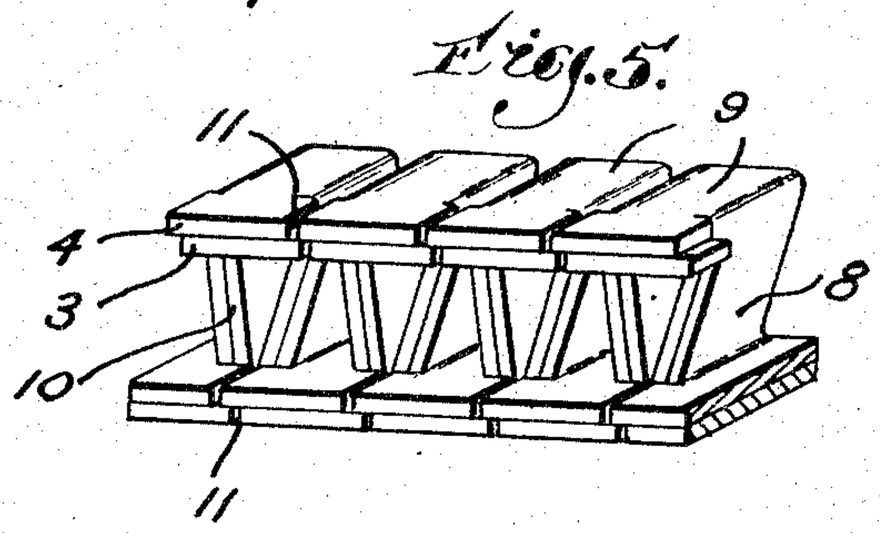
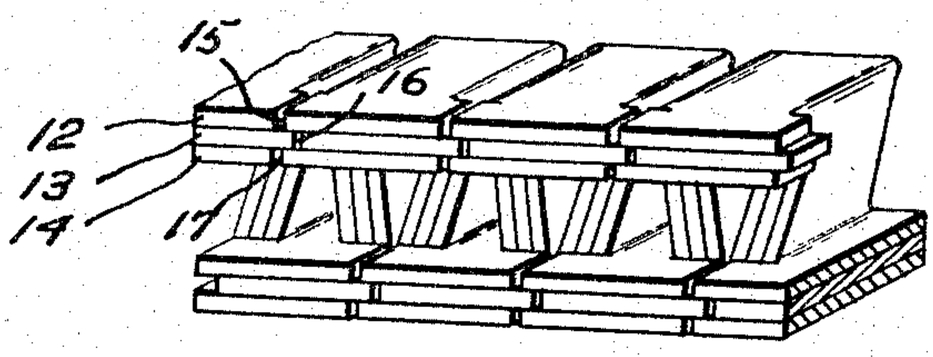


Fig. 6.



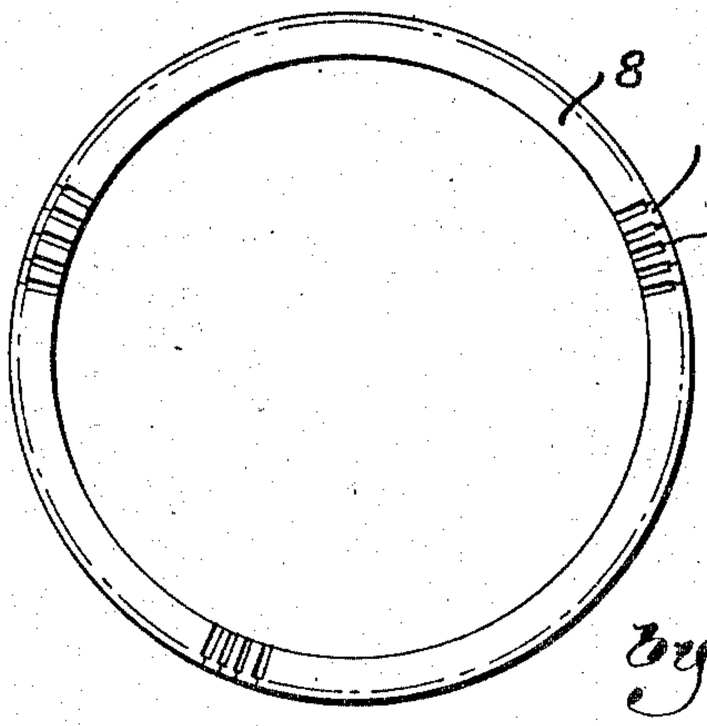


Fig. 7.

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UNITED STATES PATENT OFFICE

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PISTON RING

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2 Claims. (Cl. 309—45)

This invention relates to piston rings and more especially to coil control rings formed from strips of piston ring material.

In a copending application, Ser. No. 276,503, filed May 31, 1939, I have referred to difficulties in effecting proper distribution of oil in worn cylinders by piston rings operating at high engine speeds, and I have described and claimed ring structures fabricated from a length of metal ribbon devised to overcome these difficulties. In my earlier application a length of metal ribbon was first stamped or cut out to provide relieved edges. The strip was thereafter reversely folded upon itself and compacted into an annular body in which the relieved edges comprised oil scraping portions. It has now been found that improvements may be effected in stamped or cut out ring structures by associating together a plurality of preformed strips.

The chief object of this invention is to provide improved ring structures for effecting oil distribution on a cylinder wall, having in mind particularly means to overcome faulty oil distribution in cylinders which have become worn. It is a further object of the invention to provide a simple, cheap and efficient piston ring structure and method of manufacture therefor, in which a plurality of preformed strips of piston ring material are arranged in novel manner to form improved oil control rings. These and other objects of the invention will be readily understood from the following description when read in connection with the accompanying drawing and the novel features will be particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is a perspective view illustrating a plurality of strips of piston ring material.

Fig. 2 is a fragmentary plan view illustrating a step of preforming material such as that illustrated in Fig. 1.

Fig. 3 is a fragmentary elevational view illustrating a preferred arrangement of preformed strips with respect to one another.

Fig. 4 is a fragmentary view in partial cross section illustrating a further step of reversely folding the strips of material illustrated in Figs. 2 and 3.

Fig. 5 is a perspective view fragmentarily illustrating a finished ring resulting from compacting the folded material of Fig. 4.

Fig. 6 is another perspective view fragmentarily illustrating a modified type of ring; and

Fig. 7 is a plan view of the ring illustrated in Fig. 5.

In accordance with my invention I provide a plurality of strips of piston ring material, as for example strips 1 and 2 as illustrated in Fig. 1. A preferred material for the strips will comprise a metal ribbon such as a steel ribbon, although other suitable substances may be desired to be employed.

Along coincident edges of the strips 1 and 2, I form relieved portions 3 and 4 of strips 2 and 1 respectively. This may be effected by some suitable cutting operation, as for instance stamping, and preferably the stamping operation will further form openings 5 and 6 at the inner sides of the portions 3 and 4. These openings 5 and 6 facilitate bending operations effected on the strips as hereinafter described.

The strips 1 and 2 are then arranged so that the relieved edges 3 and 4 are in an overlapping position as may be more readily seen in Figs. 2 and 3.

In Fig. 4 I have illustrated a succeeding step in forming the strips into a piston ring material, in which the two strips are reversely folded upon themselves along lines of bending 7 indicated in Fig. 2. The reversely bent structure is then compacted to form a ring body such as that illustrated in Fig. 5 and it will be observed that the relieved portions of the strips 1 and 2 take alternate upper and lower positions such that they abut one another, with abutting portions 4 disposed above the abutting portions 3, thereby forming upper and lower oil scraping edges each of which includes two layers of piston ring material. The upper and lower edges form outer contacting peripheries of a ring 8. Those portions of the strips occurring directly in back of, and coextensive with, the relieved portions 3 and 4 become crown forming portions 9 in the finished ring 8, while the portions of the strips occurring between the relieved portions 3 and 4 are angularly disposed between the relieved portions 3 and 4 to comprise legs 10.

By disposing the strips 1 and 2 so that relieved portions 3 and 4 occur in the offset position referred to and then folding the strips, it will be seen that openings 11 between adjacent relieved portions occur out of alignment with one another, in a direction axially of the ring, thereby sealing one another from passage of oil axially through the ring. It is also pointed out that with the use of a plurality of ribbons, a plurality of scraping edges is present at both the top and bottom of the ring, which may more efficiently distribute oil on a cylinder wall.

It will be observed that a length of material

formed into a ring such as that illustrated in Figs. 5 and 7, will tend to have a uniform radial expansibility owing to the fact that upon being closed up upon itself at the several openings 11, it will immediately revert to its original position when released. This expansibility is made use of in confining the ring in a cylinder about a piston so that it may tend to become expanded uniformly in all directions against the cylinder wall and thereby adhere to non-uniform or worn points in the cylinders, effecting greater efficiency particularly in high-speed motor operation. Also, it is pointed out that all of the expansibility of the ring acts through the scraping edges, which tends to make these portions more effective in properly adhering to the cylinder walls at all points.

A further advantage in utilizing the multiple ribbon arrangement to provide oil scraping edges, consists in improved range of ring sizes. Increasing the thickness of one strip of piston ring material tends to develop considerable increase in its wall pressure. However, the range or increased diameter through which such a thickened strip ring may be expanded and still be effective is relatively small. Upon employing a plurality of strips of material, on the contrary there is secured less increase in wall pressure but the range through which such a wall pressure is effective is greatly enlarged. This is important in that it further insures maintenance of the oil scraping edges against a cylinder wall under conditions such as those where a cylinder wall has become worn out-or-round or worn tapered. In either of these worn conditions referred to, the oil ring is required to be constantly expanded into larger diameters without too great a radial pressure such as would develop excessive wear.

It will be noted that the openings 11 which provide for the ring being compressible may, when included in a ring formed from a single strip of material, present minute passageways. However, by employing a plurality of strips of material arranged in the overlapping manner shown and described, it becomes possible to preserve the openings 11 for purposes of compressibility and to seal them more completely to any passage of oil urged through the ring in an axial direction for example by gas pressure.

In Fig. 6 I have shown a further modification of ring structure which may provide even further improved oil sealing by the use of three strips of material formed in the manner already described to provide relieved oil scraping edges 12, 13 and 14. In this modification, it will be noted that there is effected a dovetailed arrangement by which one of the edges, as 13, is received between adjacent edges, as 12 and 14. Openings 15, 16 and 17 occur as described in connection with the ring structure illustrated in Fig. 5 comprising spaces between abutting oil scraping portions of respective strips. This figure is intended to be particularly illustrative of the use of any plurality of ribbons which may be desired. It is again pointed out that increasing the number of strips employed increases the range of wall pressure of the ring. The openings between the oil scraping edges are more completely sealed by the dovetailed arrangement shown and there are provided an increased number of oil scraping edges.

It will now be seen that I have provided an oil control ring having a plurality of formed oil scraping edges at both the top and bottom sides thereof. Additional means for preventing passage of oil axially of the ring has been provided. Increased range of wall pressure has been developed, and a novel step in a method of making piston rings from ribbon material has been set forth.

While I have shown a preferred embodiment of my invention, various changes and modifications may be resorted to in keeping with the spirit of my invention.

I claim:

1. A piston ring comprising spaced-apart sides, connecting portions for the sides, said sides including a multiplicity of T-shaped segments arranged in spaced-apart relation, said T-shaped segments consisting of a plurality of layers of piston ring material superimposed one upon another, said multi-layer T-shaped segments being circumferentially movable with respect to one another, each of said multi-layer T-shaped segments having a layer portion which overlaps a space between two other layer portions.

2. A piston ring comprising spaced-apart sides, connecting portions for the sides, said sides including a plurality of contiguously arranged T-shaped segments, each of said segments consisting of a plurality of layers of piston ring material superimposed one upon another, said multi-layer segments being circumferentially movable with respect to one another, and each of said multi-layer segments having a portion which extends circumferentially between spaced-apart portions of an adjacent multi-layer segment.

THOMAS A. BOWERS.