July 16, 1940. L. B. MILLER 2,208,136

PISTON RING COMPRESSOR

Filed Aug. 7, 1939

Fig. 1.

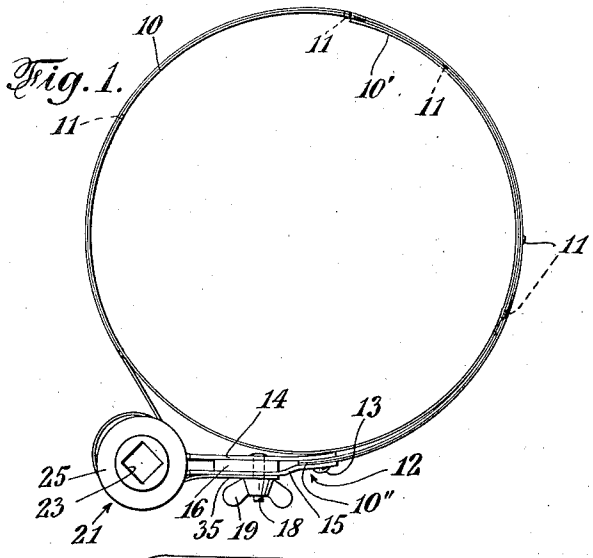


Fig. 4.

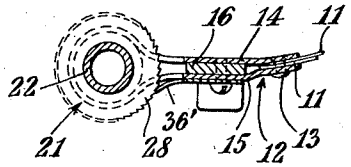


Fig. 2.

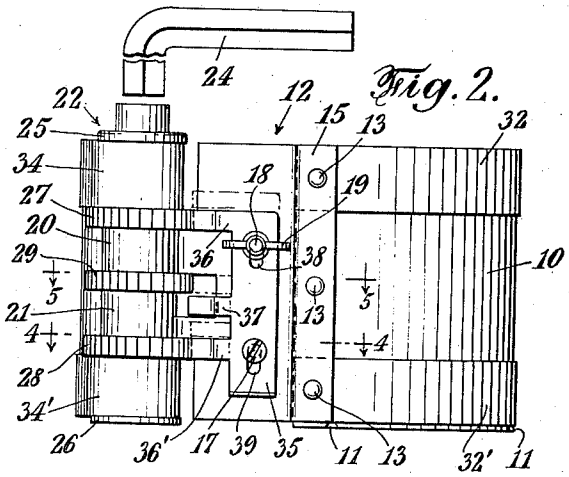


Fig. 3.

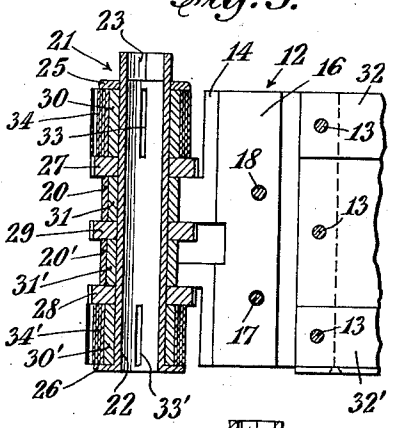


Fig. 6.

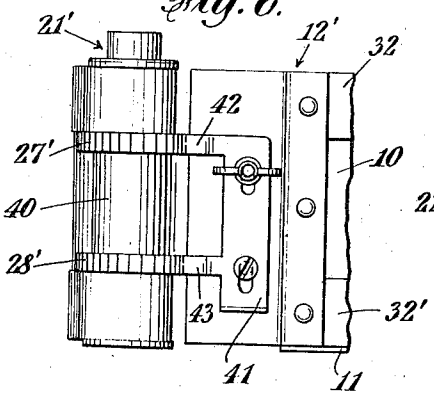


Fig. 5.

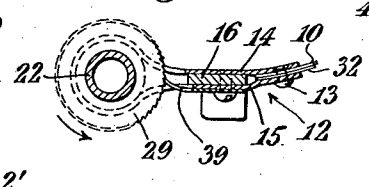
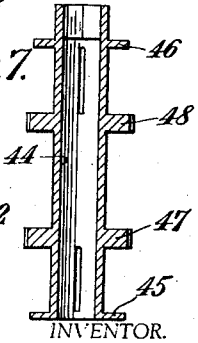


Fig. 7.



INVENTOR.
Leon B. Miller

BY

his ATTORNEY.

Patented July 16, 1940 2,208,136

UNITED STATES PATENT OFFICE

2,208,136

PISTON RING COMPRESSOR

Leon B. Miller, Brooklyn, N. Y.

Application August 7, 1939, Serial No. 288,862

3 Claims. (Cl. 29—86.4)

This invention relates to piston ring compressors, and has for its principal objects the production of piston ring compressors of an improved construction, which not only facilitates their employment with an exceptionally wide variety of piston sizes, but which may be actually set, held in position and safely released to any desired extent, and which will operate uniformly over the entire range and compress all the rings in a piston evenly, and retain them in their compressed position until they are safely inserted in the cylinder.

Another object of this invention is to produce an improved type of piston ring compressor wherein means are provided for assuring not only a uniform compression of rings into the grooves of a piston and exact operation of the device, but wherein the operation of the device may be minutely controlled, both while the device is being applied to its intended work and when being released.

The foregoing and a number of other objects and important advantages will become more fully apparent from the ensuing description of the accompanying drawing, which, although illustrating specific, presently preferred form of my invention, are by no means intended to limit me to that disclosure, and in which

Fig. 1 is a top view of my device.

Fig. 2 is an elevation thereof in one of its forms.

Fig. 3 is a partial vertical cross sectional view through the operating mechanism of my device, as illustrated in Fig. 2.

Fig. 4 is a cross sectional view taken on line 4—4 of Fig. 2.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a partial elevation of a modified form of my device, and

Fig. 7 is a vertical cross sectional view of a modified form of the rotatable instrumentality employed in my device.

Referring now more specifically to the drawing, numeral 10 denotes a relatively broad spirally wound resilient piston compressing strip which is provided at its lower edge with a plurality of outwardly directed notches 11, intended to form stops for resting the strip against the edge of the cylinder wall, into which the piston with the compressed rings is intended to be inserted. By means of these notches or stops strip 10 is prevented from inadvertently slipping into the cylinder, while the strip portions between the spaced notches serve as guides for the rings.

The free end 10' of the strip (see Fig. 1) is disposed at the interior of the substantially ring-shaped spiral formed by the strip, while the other end 10'' of the strip constitutes the exterior end thereof. To this exterior end is permanently attached a mounting 12 by means of rivets or other suitable fastening elements indicated at 13. This mounting is in the form of a looped structure having an interior leg 14 and an exterior leg 15, between which is held a stiffening or reinforcing member 16 in the form of a spacer bar, as may be clearly seen from Fig. 3. Extending through the bar 16 are screws 17 and 18, the latter preferably provided with a wing nut 19. The looped portions of the structure are indicated at 20 and 20' which are swung about an operative instrumentality rotatable within the loops.

This rotatable instrumentality constitutes for all practical purposes a one-piece hollow or tubular member 22, provided at its upper end with a socket 23 for the reception of a key or wrench 24, indicated in Fig. 2. This wrench and socket are made preferably of square cross sections. Tubular member 22 is provided with end flanges 25 and 26, and between the flanges are arranged ratchet wheels 27, 28 and 29. Ratchet wheels 27 and 28 have their teeth arranged preferably in the same direction, while the ratchet teeth of wheel 29 are set in opposite direction to the teeth of wheels 27 and 28.

In the construction shown in Figs. 2 and 3 I have shown spacers 30 and 30' arranged between flange 25 and ratchet wheel 27, and between flange 26 and ratchet wheel 28, respectively. I also provide in this construction spacers 31 and 31' between ratchet wheels 27 and 29, and between ratchet wheels 28 and 29, respectively. Spacers, as well as flanges 25 and 26, and also all three ratchet wheels are permanently united with tubular member 22 by being either secured to the latter by shrinking them thereon, or by means of spot welding, or in any other suitable way such as riveting or the like. In other words, the rotatable instrumentality lodged within loops 20 and 21 of mounting 12 represents essentially a one-piece member.

Secured by way of the outer two rivets 13, whereby mounting 12 is united with a strip 10, are the fixed ends of highly resilient, relatively narrow and thin compression bands 32 and 32'. These bands are parallel to one another and are arranged at the extreme lower and upper edges of strip 10. Their operative ends are secured within slots 33 and 33', which are cut through

spacers 30 and 31 and through tubular member 22. These movable band ends are slipped through the slots and are wound about spacers 30 and 30', respectively. The winding or tightening of the band is accomplished by inserting a wrench 24 into socket 23 and turning the entire rotatable instrumentality 21. The wound-up parts of bands 32 and 32' are indicated in Figs. 2 and 3 by numerals 34 and 34'.

Slidably mounted in respect to screws 17 and 18 is a detent plate 35, made of resilient material, and which is provided with two outer spring detents or ratchets 36 and 36' and an interior detent 37. The outer detents are adapted to respectively engage ratchet wheels 27 and 28, while the interior detent 37 is intended to cooperate with central ratchet wheel 29.

In the full line position of plate 35, shown in Fig. 2, detents 36 and 36' engage their respective ratchet wheels, while detent 37 clears ratchet wheel 29. While plate 35 is in this position, instrumentality 21 may be turned in clockwise direction, whereby compression bands 32 and 32' are being wound up. Through this operation strip 10 is being compressed or wound tight about a piston, and rings mounted in their respective piston grooves are forced into the latter.

It is obvious that while detents 36 and 36' engage their respective ratchet wheels, the ratchet wheel arrangement for each of the bands 34 and 34' will prevent individually the unwinding of these bands.

In addition my invention contemplates that the teeth of the ratchet wheel be so designed that the tightening or winding up of the bands for each tooth length will correspond to a certain measured compression of piston-engaging strip 10. Furthermore the click produced by the detents successively engaging the teeth of the ratchets enables the operator to determine by audible means the extent of dimensional changes of the compressed strip.

Detent plate 35, being provided with suitable adjusting slots 38 and 39, through which project screws 17 and 18, may be shifted within the range of these slots. The plate may be fastened in any desired position by wing nut 19, or any other suitable means. When it is desired ot release piston-engaging strip 10, wing nut 19 is loosened and plate 35 is moved to the position indicated in broken lines in Fig. 2, in which position detents 36 and 36' release their respective ratchet wheels 27 and 28, while detent 37 will engage ratchet wheel 29. Through this engagement between resilient detent 37 and ratchet wheel 29 an effective braking action will be provided for too violent an unwinding of coils 34 and 34', as ratchet, pawl or detent 37 is caused to forcibly glide over the teeth of ratchet wheel 29. The position of detent 37 is clearly indicated in Fig. 5, and the direction of unwinding of the bands is indicated by the arrow.

Another embodiment of my invention, and especially of the winding arrangement of bands 32 and 32' and of mounting 12' is indicated in Fig. 6, wherein the central ratchet wheel is omitted, while ratchet wheels 27' and 28' are retained. Instead of splitting the looped formation in the manner shown in Figs. 2 and 3, the modified form shows a continuous, one-piece loop 40 which engages the central portion of instrumentality 21' between ratchet wheels 27' and 28'.

The construction of resilient detent plate 41 with its detents or ratchets 42 and 43 also is altered since the central ratchet is eliminated. Otherwise the construction of this modified form very closely resembles the arrangement shown in Figs. 2 and 3. Detent plate 41 is made adjustable in the same way as detent plate 35 so that ratchets 42 and 43 may be disengaged from ratchet wheels 27' and 28', if so desired. Inasmuch as in the modified form of Fig. 6 the special braking arrangement is eliminated, the operator of this device will have to rely upon the internal friction between the layers of the coiled-up bands 32 and 32' and a possible frictional engagement between the detents and the faces of the ratchet wheels. This modified form is designed for devices of a relatively small range, in other words, for devices which will serve a very limited variety of piston and piston ring sizes, whereas the device described in connection with Figs. 2 and 3 has an extremely wide range, and requires therefore some means of more positively braking the unwinding force of coiled ends 34 and 34' of the compression bands.

In Fig. 7 there is illustrated a modified form of the winding instrumentality wherein the entire structure, such as employed in Fig. 6, is shown to be made of one piece, and wherein from the tubular portion 44 extend flanges 45 and 46, as well as ratchet wheels 47 and 48. This device is fabricated from drawn ratchet wheel stock, which is turned down to form the respective flanges and the recesses for accommodating band ends 34 and 34' and loop 40 of the mounting.

Operation

In either one of the two modified forms illustrated the function of my device is substantially identical. When a piston with piston rings in its grooves is to be inserted into a cylinder, it is necessary to compress the piston rings so that they move into their respective grooves sufficiently to permit the insertion of the ring-equipped piston into the cylinder cavity. This is accomplished by placing the partially expanded piston-engaging strip 10 over the piston and operating winding instrumentality 21 by means of wrench 24 in one direction, for instance in clockwise direction, whereby bands 32 and 32' are caused to be wound up. Prior to winding up these bands the detent plate is set into operative engagement with the ratchet wheels so that when the winding takes place the bands are prevented from unwinding. When the bands are sufficiently tightened so that all piston rings were fully moved into their respective grooves, the piston, with my device attached thereto, is placed over the cylinder so that the lower edge of the strip rests with its notches against the rim of the cylinder wall, whereupon the piston is slowly inserted into the cylinder. It will be understood that the tightening of strip 10 does not necessarily have to be too strenuous, but must be sufficient to hold the piston rings in the grooves during the insertion of the piston into the cylinder.

When the piston is inserted the piston ring compressor is removed and may be released. This is preferably done in first preventing the compression band from unwinding by immovably holding handle 24, shifting the detent plate so that either middle ratchet wheel 29 is engaged by its corresponding detent, in the construction shown in Figs. 2 and 3, or so that the detents of the exterior ratchet wheels will frictionally engage the faces of the latter. The handle may then be released and the unwinding of the bands will be retarded by the braking action of either the central or the end ratchet wheels. This brak-

ing provision is rather important since it often occurs that the rapid unwinding of the bands, induced by the forceful expansion of strip 10, may be so severe that it may break the anchored ends of the bands in their winding instrumentality.

Conclusion

While I am well aware of piston ring compressors of different designs and employing arrangements similar to those indicated in my disclosure, I have found that none of them compress their piston-engaging strip uniformly and especially at the extreme edges of the strip, and that instead of inducing the piston-engaging strip to assume a truly cylindrical form, the form of the strip becomes conical or otherwise out of shape and will not produce the intended function of uniformly engaging the entire surface of the piston. In order to produce a uniform compression of the piston rings it is important that the compression bands be mounted at the very edges of the piston-engaging strip, and that they are uniformly drawn or wound and that the bands are truly parallel to one another, since otherwise a twisting of the strip ensues. Such twisting of the piston-engaging strip loosens some of the rings and instead of facilitating the insertion of the piston into the cylinder this operation is made difficult and often results in the breakage of the rings.

I, therefore, believe that I am the first who constructs a piston ring compressor with two parallel compression bands arranged at the very edges of the piston-engaging strip, and that I am the first who provides an effective, positive braking arrangement which prevents the rapid unwinding of the compression bands and thereby possible damage to the device and to the operator.

While the illustrations depict specific forms of my proposed construction, it is quite obvious that changes and improvements may be made therein, and that the main features of uniformly drawing together the piston-engaging strip and the braking of the unwinding of the compression bands may be perhaps accomplished by similar other means, and I, therefore, wish it to be understood that I reserve for myself the right to make changes and improvements in the construction of my invention, all within its broad scope as expressed in the annexed claims.

I claim:

1. In a piston ring compressor, a spirally wound, resilient piston engaging strip intended to always assume a substantially true cylindrical shape, a pair of compression bands designed to draw the strip to its intended true shape, said bands being parallel to one another and being so spaced that they uniformly engage the extreme edges of the strip, a mounting fixedly secured to the outer end of the strip and forming a fixed anchorage for one end of the bands, band winding means rotatably lodged in the mounting and engaging the other ends of the bands, said winding means comprising a hollow structure having end flanges for guiding the outer edges of the bands and ratchet wheels between the flanges for guiding the inner edges of the bands, and positive latching means for engaging the ratchet wheels.

2. In a piston ring compressor, the combination with a relatively broad, resilient strip, wound spirally to a substantially true cylindrical form and adapted to be maintained in that form at any desired diameter, for the reception and retention of any desired sizes of piston rings; of a pair of windable, parallelly disposed compression bands encircling the extreme edges of the cylindrically wound strip and adapted to vary the latter's diameter while maintaining the strip in its true cylindrical form, band operating means secured to the outer end of the strip and adapted to facilitate the simultaneous winding and unwinding of both bands under uniform tension, means for maintaining the bands parallel and in engagement with the extreme edges of the cylindrical form of the strip, means for positively controlling the operation of the bands provided with said operating means, said controlling means comprising ratchet arrangements for each band and including adjustable and releasable ratchets.

3. In a piston ring compressor, the combination with a spirally wound, resilient strip, adapted to always form a substantially true cylinder, of a pair of always parallelly maintained, simultaneously and uniformly windable compression bands, adapted to always engage the extreme edges of the cylindrically formed strip, and releasable, positively controlled means for facilitating the simultaneous and uniform winding and unwinding operations of both bands to reduce and increase, respectively, the diameter of the cylinder formed by the strip, and for maintaining its true cylindrical shape, said controlled means comprising a shaft, a pair of guide means at the ends thereof, one for each compression band, for maintaining the bands in parallel, overlapping relation, as they are wound, and positive latch means for holding the shaft in adjusted position.

LEON B. MILLER.