Jan. 13, 1959 H. HAMMER 2,868,466

RING COILING MACHINE

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Fig.1

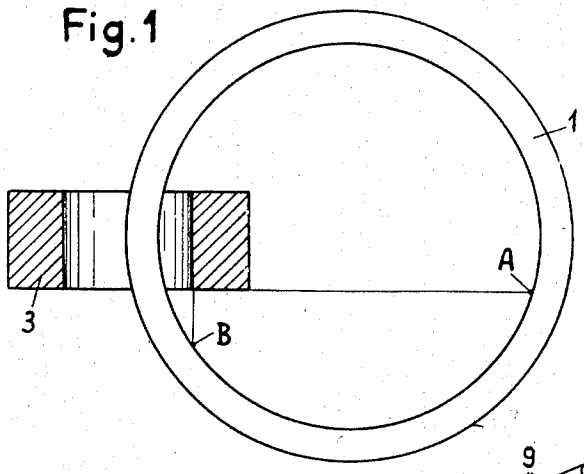
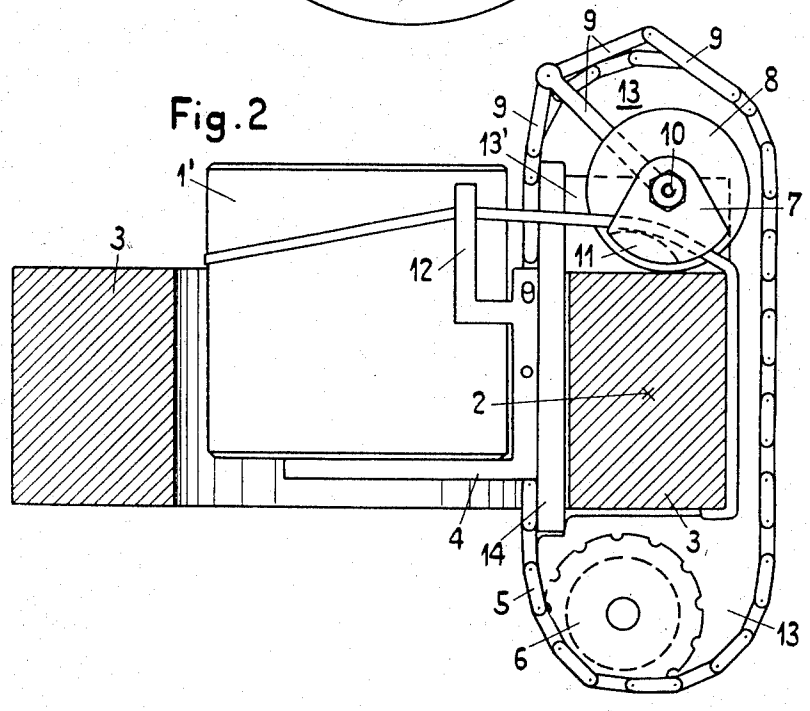


Fig.2



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Fig. 3

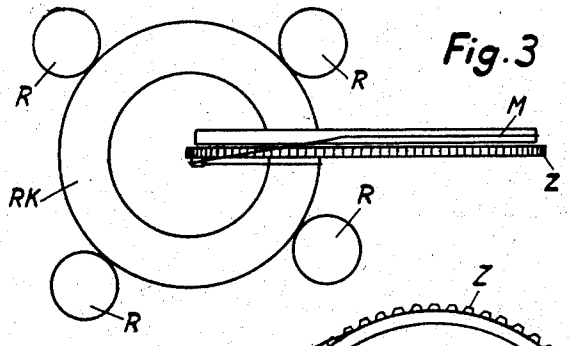


Fig. 4

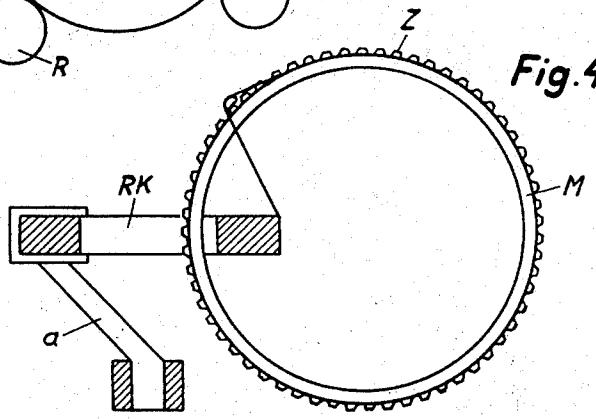
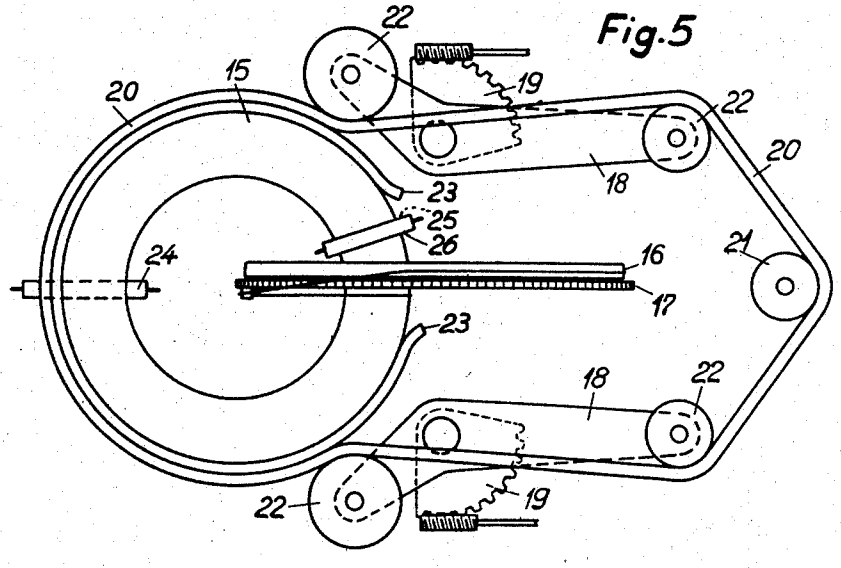


Fig. 5



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RING COILING MACHINE

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Claims priority, application Switzerland June 11, 1953

1 Claim. (Cl. 242—4)

Ring coiling machines for the coiling of wire or tape round rings have been proposed in which as a holder of the coiling material needed for the coiling process, exchangeable reel-shaped magazines were used, which rotate about their own axis and are at the same time led around the ring profile.

With the ring coiling machines on the market the coiling material required for winding around the ring profile is carried along during the coiling in a circular magazine in planes approximately radial relative to the ring profile. In order to fill this magazine with the material to be coiled (wire, tape) it is indispensable that the ring profile be firstly clamped into the machine. This filling process increases accordingly the actual coiling time by a substantial factor.

The total coiling time becomes more unfavorable still when for certain reasons the ring profile is to be wound with coiling materials of different kinds since in this case the time periods lost for filling increase. In order to be able to carry along the quantity of coiling material required even in extreme cases, the magazine must have an optimum size diameter, so that the ring profile to be wound is strongly eccentrical relative to the magazine. Consequently very unhomogeneous pull conditions result which make an accurate coiling on the ring profile very difficult, and do not produce an accurate position of the individual coils with respect to one another.

With ring coiling machines there is moreover a demand for as accurate and constant a feeder movement of the ring profile per revolution of the machine as possible, i. e. the distance of the individual turns from one another ought to be adjustable at will, but once adjusted, should remain constant during the coiling process.

With the object of avoiding the aforesaid difficulties and attaining the above advantage, I provide means for keeping the axis of rotation of the magazines parallel to the axis of symmetry of the ring profile, while the magazine is passed through the hollow of the ring, as well as immediately before and after.

Another important features of the invention consists in that a feeder device is provided which comprises an endless belt hugging the ring over a circumferential length of more than 180° and transmitting a rotational movement to the ring about its axis, and adapted to coil rings which have various diameters, without having to exchange the said belt.

In order that the invention may be clearly understood and readily carried into effect, some embodiments thereof will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a view of a known device of this type showing the ring to be wound in section.

Fig. 2 is a view similar to Fig. 1 but showing an embodiment of the present invention on a larger scale.

Fig. 3 is a view of another known device such as shown in Fig. 1 but taken at right angles to the view of Fig. 1.

Fig. 4 is a view similar to Fig. 1 of another known form of device.

Fig. 5 is a view similar to Fig. 3 but showing another embodiment of the present invention.

Referring first to the known embodiment diagrammatically illustrated in Fig. 1, it will be seen that the distance of the profile of the ring **3** from the annular magazine **1** varies considerably as shown at the points A and B, a disadvantage which is to be avoided by the ring coiling machine according to this invention.

Referring now to the first embodiment of a machine according to the invention as shown in Fig. 2, the magazine **1'** is here in the shape of a spool and moves on an orbit about the center **2** of the profile of the ring **3**. The coiling material required is released from the magazine **1'** at the spot on the ring where needed as the magazine rotates about its own axis.

As will be seen from Fig. 2, the magazine **1'** is for this purpose journalled rotatably about its spool axis on a bracket **4**. This bracket, in turn, is supported on a link chain **5** which is driven by a sprocket wheel **6**. A brake **7** for the winding material is pivotably mounted on the axle of a guide roller **8**. This guide roller **8** is in turn moved closely around the profile **3** of the ring by means of a linkage **9**.

The said brake **7** consists of two plates which are held together by a nut **10** by which the required tension in the winding material is set up. Between the two plates of the brake **7** there is arranged a guide face **11** which prevents the coiling material from sliding off.

The bracket **4** has an extension **12** provided with a guide slot which keeps the winding material in the coiling plane as required. The chain **5** runs on a track **13** which is formed in such a manner that it passes through the interior of the ring **3** in a straight line parallel to the axis of the ring. By this arrangement the bracket **4** as well as the magazine **1'** pass in a straight line through the hollow of the ring **3**, and the said magazine can still have an optimum outer diameter and height.

Spool-shaped magazines hitherto used have been constructed with their axis at right angles to the axis of the ring so that they were very limited in their dimensions and by no means always complied with the actual requirements for coiling material to be carried by them.

A substantial advantage resides also in the arrangement of the magazine according to Fig. 2, in that when coiling flat tape on to ring profiles the plane of the tape need not be twisted 90° when leaving the magazine.

Since the brake **7** alone determines the tension required for the coiling, and since the tension is completely uniform over 360° and becomes effective in the immediate proximity of the surface of the ring profile, the individual turns of the coil, too, are accurately fixed in their position relative to one another. The required circumferential feed of the ring in the coiling process is produced in the usual way and is accordingly not illustrated in Fig. 2. The bar **14** serves merely for securing the ring **3** in position. Its surface lies in the same plane as the track **13**.

Referring now to Fig. 3, in a known embodiment the ring RK is held for example by four rollers R, the distance of which is adapted to the diameter of the said ring. The rollers R are mounted rotatably about their own axes, one or several of them being driven by toothed gearing, and they rotate the ring RK by frictional contact.

The toothed crown Z draws, in the usual way, coiling material from the magazine M, and by rotating, applies the turns of the coiling material on to the ring profile. Coiling of several layers on to said ring profile is possible, but the friction of the rollers R does not by any

means always suffice for carrying along the ring RK, which may lead to slipping. Moreover the feed is altered when a driving roller first comes into contact with that part of the circumference of the ring which already contains windings. This undesirable effect is naturally the larger, the smaller the outer diameter of the ring is in comparison to the thickness of the coiling material, e. g. particularly when flat tape is applied. The change of pressure of the rollers R on the portion of the ring RK already containing coils of insulated wire may lead also to damage to the insulation. This sort of feed becomes unsuitable when very thick wires have to be coiled on to the ring, because in extreme cases a driving roller could be wedged in between two consecutive turns, whereby the feed would be brought to a standstill.

In the known embodiment according to Fig. 4 the circumferential feed of the ring RK is effected by clamping it in the forked end of an arm *a* which is rotatable about the axis of the ring and is driven by toothed gearing (not shown). In this embodiment the problem of slipping is abolished. It permits only the coiling of a single layer on to the ring.

A perfect feeder device would require the combination of the effects of the embodiments according to Figs. 3 and 4 which would unavoidably lead to complication and increased costs of the feeder gearing.

In the embodiment of this invention according to Fig. 5, the ring **15** is supported from below by rollers **24** and **25**, and a roller **26** on top prevents the said ring **15** from giving way to a strong upward pull of the wire. An endless belt **20** is so arranged that it runs over the rollers **22** and the driving pulley **21**, and also over a portion exceeding 180° of the circumference of the ring **15**.

The winding of the ring profile is effected in the usual way by means of the toothed crown **17** which draws the coiling material required from the magazine **16**. The rollers **22** are rotatably journalled on two-armed levers **18**, which are pivotably mounted, and can be turned by means of worm gears **19**.

For smaller outer ring diameters the rollers **22** nearer to the circumference of the ring are adjusted more closely to one another, and thereby the rollers **22** lying more remote therefrom are automatically spaced more widely apart from one another, whereby the same endless belt can be used for all outer ring diameters occurring in practice.

The driving pulley **21** is shiftably mounted in order to generate the pressure required for the belt **20** to turn the ring **15**. Between the belt **20** and the circumference of the ring **15** special kinds of intermediate foils **23** may be inserted, which on the one hand set up a resilient connection between these two elements, and on the other hand effect a compensation of the external diameters between the portion of the ring already wound and the portion not yet wound, so that the circumferential feed thereof per layer remains constant. Thus the flexible band **23** unwinds from the ring **15** at one end as the ring **15** rotates while the other end of band **23** is adjacent the first wound portion of the ring so as to provide a substantially continuous outer surface to the partially wound ring **15**. This arrangement becomes particularly effective with high cross section of the coiling material (copper tape). Damage to the coils is likewise excluded thereby, and by a favorable distribution of pressure during the feed a very pressure-sensitive iron material such as Permenorm (proprietary name) laminations, can be used as material for the ring without sustaining any damage, in spite of an absolutely slip-free operation.

The endless belt **20** may consist of artificial material or vulcanized rubber, or could alternatively be replaced by a chain. If desired, the number of the rollers serving for guiding the belt could be increased.

While I have herein described, and illustrated in the accompanying drawing, what may be considered typical and particularly useful embodiments of my said invention, I wish it to be understood that I do not limit myself to the particular details and dimensions described and illustrated, for obvious modifications will occur to a person skilled in the art.

What I claim as my invention and desire to secure by Letters Patent is:

A ring coiling machine for coiling wire or tape material upon a ring, comprising in combination: an endless transport means hugging more than 180° of the circumference of the ring to be wound, adjustable guide means engaging the said endless transport means and adapting the same to varying outer diameters of rings, said guide means comprising a first guide roller adapted to press said endless transport means against the ring to be wound at the one side thereof where the transport means is moved into contact with the ring, a second guide roller adapted to press said transport means against the ring to be wound at the opposite side where the transport means is moved out of contact with said ring, at least one additional guide roller for said transport means which is outside the region of rotation of said ring, means for mounting said last named additional guide roller for lateral movement with respect to the axis thereof whereby the length of the path of the transport means between said first and second guide rollers can be changed to accommodate rings of different sizes, drive roller means outside the region of rotation of said ring for positively moving said transport means, a magazine storing the material to be wound about said ring, and an intermediate strip of flexible material arranged between the said endless transport means and the ring, said intermediate strip of flexible material being shorter in length than the circumference of the ring to be wound and approximating in thickness the outside thickness of the winding to be applied, one end of said strip being adjacent the first portion of the ring to be wound, the other end of said strip extending up to approximately the next portion of said ring to be wound.

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