March 20, 1928. **1,663,448**

R. EINSELE

MACHINE FOR MANUFACTURING CHAIN MAIL IN TUBULAR SHAPE

Filed Jan. 29, 1925

Fig. 1.

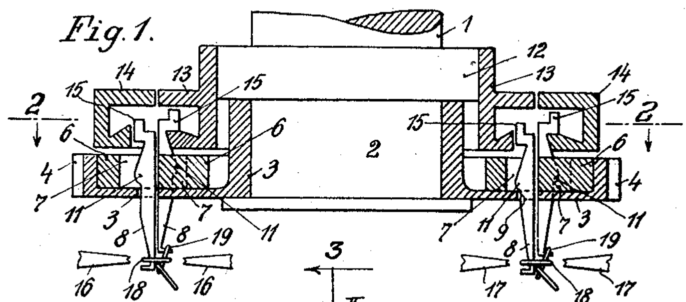


Fig. 2.

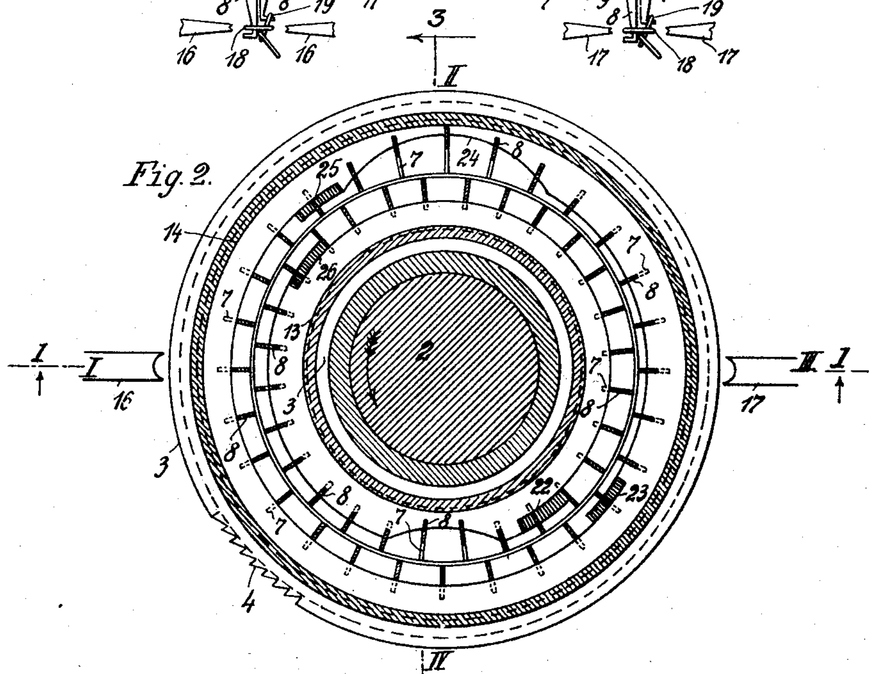
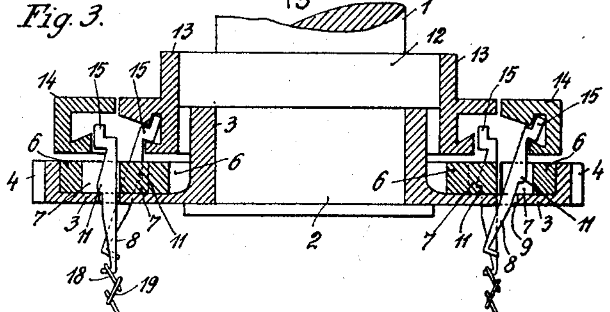


Fig. 3.



Inventor:

Robert Einsele

by [illegible]

Attorney

Patented Mar. 20, 1928. 1,663,448

UNITED STATES PATENT OFFICE.

ROBERT EINSELE, OF PFORZHEIM, GERMANY, ASSIGNOR TO RODI & WIENENBERGER, AKT.-GES. FÜR BIJOUTERIE- & KETTENFABRICATION, OF PFORZHEIM, GERMANY.

MACHINE FOR MANUFACTURING CHAIN MAIL IN TUBULAR SHAPE.

Application filed January 29, 1925, Serial No. 5,587, and in Germany July 24, 1922.

This invention relates to a machine for the manufacturing of chain mail in the shape of tubes, the finished chain mail being held alternatively by two rows of suspension hooks arranged opposite one another but displaced the one with regard to the other.

The machine according to the invention differs from the machines of known type working with two pairs of ring-forming tools in that the chain mail in the range of the two pairs of ring-forming tools is always completely at rest this being favorable for the inserting of the several ring-elements. According to the invention this is attained by the ring holders being mounted on a disk adapted to be rotated stepwise of the length of the diameter of a ring and co-operating with stationary cam elements in such a manner that the mutual position of the ring holders at the points where the meshes are formed remains unaltered, the formation of the mesh being not prejudiced by movement of the ring holders, the rows of rings being mutually changed at the points displaced 90°. The turning of the wire mesh tube is further utilized for the movement of the ring holders so that a separate drive for the two groups of holders is not necessary.

The improved machine is shown on the accompanying drawing.

Fig. 1 is a sectional elevation on line 1—1 of Fig. 2,

Fig. 2 is a plan view on line 2—2 of Fig. 1, and

Fig. 3 is a section on line 3—3 of Fig. 2.

The cylindrical stud 2 mounted on the machine frame 1 carries the feeding disk 3 which has feed teeth 4 in its outer rim and is intermittently rotated for the length of the diameter of a ring by means of a ratchet pawl. The feeding disk 3 has an annular groove in which a body 6 is located which has radially directed apertures 7 displaced with regard to one another and designed to accommodate and guide the ring holders 8. The feed disk 3 has slots 9 similar to the apertures 7 of body 6 with which engage the tapering shafts of the ring holders 8. These slots 9 serve to guide the ring holders or hooks 8 at their different movements. The oscillating movements of the hooks 8 are limited by a thickening 11 which comes in contact with the feeding disk 3. The stationary stud 2 has on its upper part a collar 12 designed to receive the ring elements 13 and 14 which are not rotatable and have curved guides concentric the one to the other, said ring elements 13, 14 serving to guide the ring holders or hooks 8 which have each a nose 15 so that they are adjusted into the correct position with regard to the ring-forming tools 16 and 17 when the feeding disk 3 is rotating, in order to effect the mutual releasing of the rows of meshes.

Two similar opposite working points are arranged the operation being as follows:

The tube of wire mesh hanging at the one working point at the tools 16 has been gripped by the hooks of the inner row of ring holders at the rings recently formed, these hooks being in the raised position (Fig. 1). The hooks of the corresponding outer row are at this moment in the lowest position so that rings which are newly formed and inserted through the rings 19 suspended on the inner row of hooks encircle the hooks of the outer row. When the feeding disk 3 is further rotated 90° these hooks are controlled the one after the other when moving from position I into the position II (Fig. 2) by the curved pieces 13, 14 in such a manner that at first the hooks of the inner row of hooks at the left side of Fig. 1 are oscillated in outward direction and let drop the meshes of the last row of rings 19 whereupon the recently formed rings 18 are caught on the ends of the hooks belonging to the outer row (Fig. 3 left side). When the rotation of disk 3 in the direction of the arrow (Fig. 2) of 90° continues (position III) the holders of the several rows adopt the position shown at the right side of Fig. 1, those holders which belong to the inner row of hooks adopt the lowest position and those belonging to the outer row adopting the highest position. In this position of the machine new rings are inserted by the ring forming tools 17 said rings encircling the ring holding hooks of the inner row. After a further rotation of disk 3 from position III to position IV the ring holders adopt the position shown in Fig. 3 right side, those of the outer row releasing the rings of the last but one row and those of the inner row having gripped the rings which have been last formed.

At a further quarter rotation of disk 3 the ring holders adopt again the position shown in Fig. 1 left side.

The control of the ring holders is effected in that the noses 15 of the ring-holders 8 cooperate with suitable apertures and curved elements of the annular bodies 13 and 14. When the holders of the inner row oscillate back into their initial position they are lowered by an incline 22 of the annular element 13 until the projection 11 on the holders 8 rest on the feeding disk 3 (Fig. 1 left side). The holders of the outer row on which the ring mesh is hanging slide upward on the incline 23 of the annular element 14 in order to feed the chain mail at a convenient height to the ring-forming tools 17 (Fig. 1 right hand). The operations described are then repeated in inverse order.

The holders of the outer row of holders are oscillated in outward and inward directions by the curve 24 of the ring element 14 and lowered by the incline 25 whereupon the holders of the inner row of holders ascend along the incline 26 of the ring element 13 and in this position the chain mail is again conducted towards the ring-forming tools 16.

In this manner the mutual changing of the rows of rings takes place outside the range and independently of the ring forming tools whereby a rapid and secure working of the machine, easy to supervise, is ensured.

I claim:—

1. In a machine for manufacturing chain mail in tubular shape with opposite working points in which the finished chain mail is alternately held suspended by two groups of opposite ring holders displaced the one with regard to the other, in combination with the inner row of ring holders and with the outer row of ring holders, a fixed axle, a feeding disk rotatably mounted on said fixed axle and having slots in which said holders are oscillatably mounted, means for rotating said disk step by step the distance of one diameter of a ring, a collar on said fixed axle, stationary ring elements fixed on said collar above said feeding disk, cam-like thickenings on said ring elements at points displaced 90° with regard to the points of working, said ring elements acting upon said ring holders in such a manner that when said ring holders are passing through the points of working they are guided by the normal surface of said ring elements so that the mutual position of said ring holders remains the same, the cam-shaped thickenings of said ring elements acting upon said ring holders at points spaced 90° from said working points to make said ring holders carry out the movement required for the changing of the row of rings.

2. In a machine for manufacturing chain mail in tubular shape with opposite working points in which the finished chain mail is alternately held suspended by two groups of opposite ring holders displaced the one with regard to the other, in combination with the inner row of ring holders and with the outer row of ring holders, a fixed axle, a feeding disk rotatably mounted on said fixed axle and having slots in which said holders are oscillatably mounted, means for rotating said disk step by step the distance of one diameter of a ring, a collar on said fixed axle, stationary ring elements fixed on said collar above said feeding disk, cam-like thickenings on said ring elements at points displaced 90° with regard to the points of working, said ring elements acting upon said ring holders in such a manner that when said ring holders are passing through the points of working they are guided by the normal surface of said ring elements so that the cam-shaped thickenings of said ring elements act upon said ring holders at points spaced 90° from said working points to make said ring holders carry out the movement required for the changing of the row of rings, and a projection at the middle of the outer surface of each ring holder designed to rest upon said feeding disk when said ring holders are in the lowest position, and a nose at the upper end of the same surface of each ring holder which nose cooperates with said cam-shaped thickenings of said stationary ring elements.

In testimony whereof I affix my signature.

ROBERT EINSELE.