Mar. 6, 1923. 1,447,530

H. BUSCHER

LACE BRAIDING MACHINE

Filed Aug. 14, 1919 2 sheets-sheet 1

Fig. 1

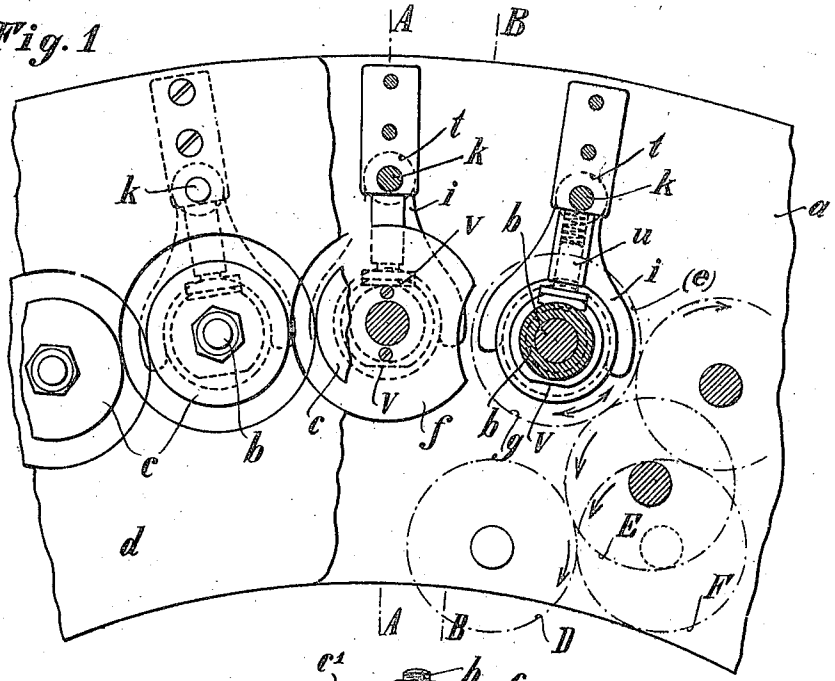
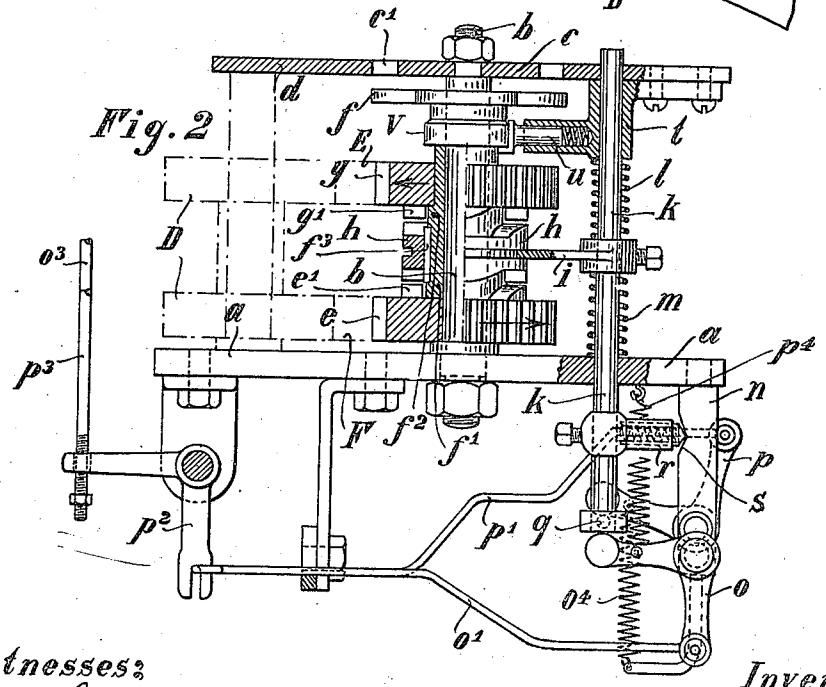


Fig. 2



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Mar. 6, 1923.

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2 sheets-sheet 2

Fig. 3

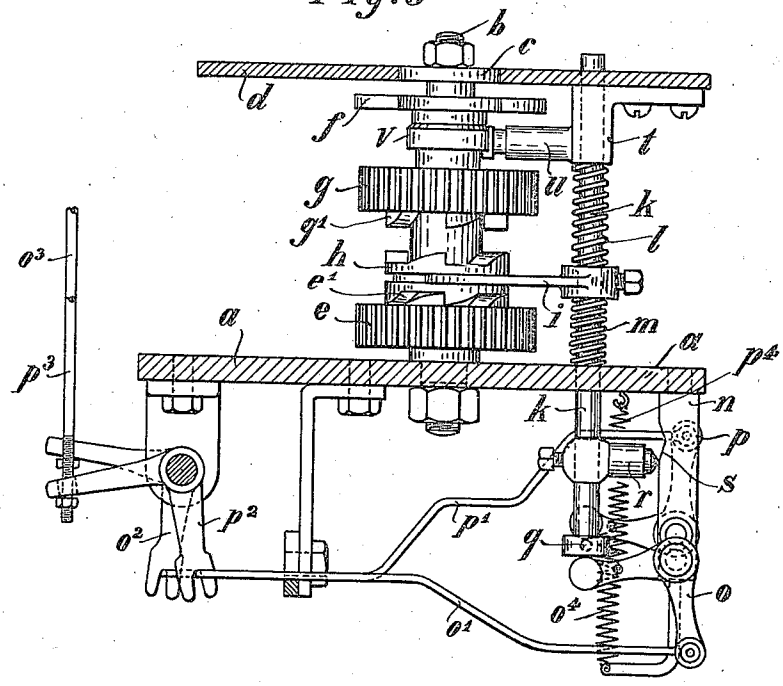
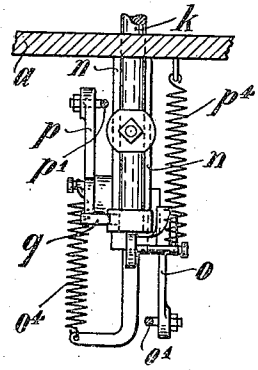


Fig. 4



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Patented Mar. 6, 1923. 1,447,530

UNITED STATES PATENT OFFICE.

HERMANN BUSCHER, OF LANGERFELD, NEAR BARMEN, GERMANY.

LACE-BRAIDING MACHINE.

Application filed August 14, 1919. Serial No. 317,480½.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, HERMANN BUSCHER, a citizen of the German Republic, and resident of Langerfeld, near Barmen, Germany, have invented certain new and useful Improvements in Lace-Braiding Machines, for which I have filed an application for patent in Germany on Oct. 31, 1914, Patent No. 294966, and of which the following is a specification.

My invention relates to a so-called single-thread lace braiding machine wherein the track for the bobbin-carriers is composed of a series of substantially circular partial tracks communicating with each other on their points of contact, and wherein each partial track is provided with rotatable and arrestable drivers for the bobbin carriers, said drivers being controlled by the pattern gear and adapted to be rotated only when the bobbin carriers are intended to be moved on the particular partial track. In the known machines of this kind each driver is rotatable in one direction only, the direction of rotation of one driver being contrary to that of the adjacent one. Consequently the bobbin carriers can be moved in the partial tracks merely in the predetermined direction of rotation of the respective drivers.

The main object of my invention is to provide pattern gear controlled means whereby the bobbin carriers can be moved in each partial track, at pleasure, either in the one or the other direction. By these means, on the one hand, many superfluous movements of the bobbin carriers hitherto necessary in producing certain known patterns may be avoided and consequently the number of pattern cards reduced, while on the other hand a novel mode of moving the bobbin carriers through the track and thereby the production of certain new patterns is rendered possible, for instance, the bobbin carriers may be moved from one partial track to any other partial track while remaining on the same side of the track, that is to say, without interbraiding the threads of the bobbins which by this movement change their respective positions.

With this and other objects in view my invention consists in the novel arrangements and combination of parts fully described in the following specification and pointed out in the claims, reference being had to the accompanying drawings, in which—

Fig. 1 is a top view, partly in section, of a portion of a lace braiding machine,

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

Fig. 3 is a sectional elevation on the line B—B of the Fig. 1, and

Fig. 4 is a detail.

Like letters of reference indicate like parts throughout the drawings.

a is the bottom plate of the machine to which are fastened the pillars *b*. The latter bear at their upper ends the fixed circular plates *c* situated as well known in recesses of the upper plate *d*. The spaces c^1 between the plates *c* and the recessed upper plate *d* form the track for the bobbin carriers which, as obvious from Fig. 1, is composed of a series of circular partial tracks communicating with each other between each pair of adjacent plates *c*. For moving the bobbin carriers in the track each partial track is provided with a driver *f* situated immediately below the respective plate *c*. The drivers *f* are by means of their sleeve-like hubs f^1 rotatably mounted on the respective pillars *b*.

According to my invention each driver may be rotated, at pleasure, to the left or to the right. To this end, there are arranged two impellers for each driver, said impellers consisting of a pair of toothed wheels *g* and *e*, spaced apart and rotatably mounted the one, *g*, on the driver-hub f^1 which for this purpose is provided with a shoulder f^2, the other, *e*, below the said hub immediately on the pillar *b*. All wheels *g* and *e* of the machine are constantly rotating, one each of said wheels being driven by means of connecting gearings D, E and D, F, while all other are rotated by the mutual mesh of the adjacent wheels *g* and *e*, respectively. Provision is made however that the wheels *g* and *e* belonging to one and the same driver are driven in counter direction. For instance, by the engagement of the connecting wheel E with the wheel *g* of the one driver and by the engagement of the connecting wheel F with the wheel *e* of the adjacent driver, the wheel *g* visible in Figs. 2 and 3 revolves to the left, while the wheel *e* visible in the same Figs. revolves to the right.

Accordingly the wheels meshing therewith are also rotated in counter direction, but in the immediately neighboured pair of wheels it is the wheel *e* that revolves to the left and the wheel *g* that revolves to the right, and so on.

Between each pair of wheels *g* and *e* a coupling *h* is mounted on the hub f^1 of the driver, the coupling being by means of a feather-key f^3 axially displaceable but non-rotatable on the hub. The coupling *h* has on its upper and lower face clutches adapted to coact with corresponding clutches g^1 and e^1 provided on the lower face of the wheel *g* and on the upper face of the wheel *e*, respectively, so that by an axial displacement of the coupling sleeve *h* the driver *f* may at pleasure be coupled to the wheel *g* or to the wheel *e* and thus rotated one time to the left, the other time to the right, or finally disconnected from both wheels and thereby arrested.

The coupling sleeve *h* has a circumferential groove engaged by a forked arm *i*, fixed to a rod *k* which latter is vertically guided in holes of the bottom plate *a* and the upper plate *d*. Two coiled springs *l* and *m* surrounding the rod *k* are situated the one above, the other below the hub portion of the arm *i*, said springs having the tendency to hold the rod *k* and therewith the coupling sleeve *h* in their middle position wherein the driver *f* is disconnected from the wheel *g* as well as from the wheel *e*. The axial displacement of the coupling sleeve *h* is effected by means of the pattern gear. For this purpose two angle levers *o* and *p* are provided which are pivotally journalled on a bracket *n*, fastened to the underside of the bottom plate *a* of the machine. One arm each of said two angle levers is, in a well known manner, by means of intermediate combinations of rods and levers o^1, o^2, o^3 and p^1, p^2 and p^3, respectively, connected to a separate lifting wire of the pattern gear so that the two levers *o* and *p* may be turned independently from one another. The other arms of the angle levers *o* and *p* engage a head *q* provided at the lower end of the rod, and what is more, the lever *o* engages said head from below, the lever *p* in the contrary from above. Therefore, on turning the lever *o* by means of the pattern gear the rod *k* is lifted, but on turning the lever *p* it is lowered causing the coupling sleeve *h* to engage either the clutches of the wheel *g* or that of the wheel *e*. After the pattern gear has released the respective lever *o* or *p* the rod *k* and the coupling sleeve *h* are returned into their middle position by the action of the one or the other spring *l* or *m*, while the lever *o* or *p* is returned to its initial position the action of the spring o^4 or p^4 respectively. In order to securely hold the rod *k* and the sleeve *h* in the middle or disengaging position a spring bolt with wedge-like head is fitted to the rod *r* which in that position engages a notch *s* in the bracket *n*.

The drivers *f* have, as is well known, at diametrally opposite side notches c^1, c^2 for the engagement of the downwardly projections or pins of the bobbin carriers. Said notches are, as is obvious from Fig. 1, in this instance, provided with two driving edges each, that is to say the notches are so shaped that the drivers are apt to take the bobbin carriers along in both directions. The notches of the drivers are furthermore, but in a known manner, so shaped that each driver, when arrested closes the respective partial track against the neighbouring one. Thus the drivers resting for a time serve simultaneously as a guide for the bobbin carriers moving on the adjacent partial track. Instead of or besides this, the usual and well known switches, preferably controlled by the pattern gear, may be arranged for guiding the bobbin carriers at the communication-places of the partial tracks.

The drivers are in the example, shown adapted to rotate each time for one half revolution of the wheel *g* or *e*, whereupon they are arrested for at least one further half revolution of the wheels *g* and *e*. In order to prevent unintended rotation of the drivers after being disconnected from the wheels *g* and *e*, the hub f^1 of each driver is provided with two flattened portions *v*, *v* arranged at diametrally opposite sides. Coacting with said flattened portions is a spring bolt *u* which is guided in a bracket *t* fastened to the underside of the upper plate *d* and bearing with its flat head against the one or the other flattened portion *v*, *v* of the driver hub thus securing the driver in its resting position.

As will be readily understood from the foregoing description, all the drivers *f* may, at pleasure, be rotated either to the left or to the right, consequently the bobbin carriers can at every place of the track, that is to say, independently of the particular partial track in which they may be at the time moved, at will, in the one or the other direction. The moving direction of the bobbins depends only upon the control of the coupling sleeves *h* by the pattern gear which, of course, is governed by the jacquard-cards in correspondence to the pattern to be produced. Thus quite novel modes of moving the bobbin carriers through the track result, which enables me to produce certain new patterns and to omit many idle movements of the bobbin carriers hitherto necessary, in producing known patterns.

Claims:

1. In a lace braiding machine, in combination: a plurality of bobbin carriers, a track for said bobbin carriers, rotatable and arrestable drivers for moving said bobbin carriers in said track, and pattern gear con-

trolled direct and reverse mechanism for each of said drivers whereby it may be rotated, first in one direction and then in the other.

2. In a lace braiding machine, in combination: a plurality of bobbin carriers, a track for said bobbin-carriers, rotatable and arrestable drivers adapted to move said bobbin carriers in said track in both directions, two impellers for each of said drivers, said impellers being adapted to continuously rotate, the one to the left, the other to the right, and pattern gear controlled means normally held in inoperative position and adapted to connect the drivers either to the one or the other of the respective two impellers.

3. In a lace braiding machine, in combination: a plurality of bobbin carriers, a track for said bobbin carriers, a series of fixed pillars, a series of rotatable and arrestable drivers with sleeve-like hubs mounted on said pillars and adapted to move the bobbin carriers in said track in both directions, a series of gear wheels, rotatably mounted on said sleeve-like hubs of said drivers, a second series of gear wheels mounted coaxially with the wheels of said first series of gear wheels, the wheels of said second series of gear wheels being adapted to revolve in counter direction to the respective wheels of said first series of gear wheels, clutches on the adjacent faces of said gear wheels, a double faced coupling between each co-axial pair of said gear wheels, said couplings being axially movable but non rotatably mounted on said sleeve-like hubs of said drivers, resilient means tending to hold said couplings in their inoperative position, and pattern gear controlled means adapted to axially displace said couplings.

4. In a lace braiding machine in combination: a plurality of bobbin carriers, a track for said bobbin carriers, a series of fixed pillars, a series of rotatable and arrestable drivers with sleeve-like hubs mounted on said pillars and adapted to move the bobbin carriers in said track in both directions, a series of gear wheels rotatably mounted on said sleeve-like hubs of said drivers, a second series of gear wheels mounted co-axially with the wheels of said first series of gear wheels, the wheels of said second series of gear wheels being adapted to revolve in counter direction to the respective wheels of said first series of gear wheels, means for continuously rotating said two series of gear wheels, clutches on the adjacent faces of said gear wheels, a double faced coupling between each co-axial pair of said gear wheels, said couplings being axially movable but not rotatably mounted on said sleeve-like hubs of said drivers, forked arms engaging a groove in said couplings for governing same, vertically guided rods carrying said forked arms, resilient means tending to hold said rods with said forked arms in their middle position, and pairs of pattern gear controlled levers, engaging said rods and adapted to lift and lower said rods with said forked arms.

5. In a lace braiding machine, in combination: a plurality of bobbin carriers, a track for said bobbin carriers, a series of fixed pillars, a series of rotatable and arrestable drivers with sleeve-like hubs mounted on said pillars and adapted to move said bobbin carriers in said track in both directions, resilient means adapted to hold said drivers in their resting position, a series of gear wheels rotatably mounted in said sleeve-like hubs of said drivers, a second driver of gear wheels mounted co-axially with the wheels of said first series of gear wheels, the wheels of said second series of gear wheels being adapted to revolve in counter direction to the respective wheels of said first series of gear wheels, connecting gearings adapted to continuously rotate said two series of gear wheels, clutches on the adjacent faces of said gear wheels, a double faced coupling between each co-axial pair of said gear wheels, said couplings being axially movable but non rotatable on said sleeve-like hubs of said drivers, forked arms engaging a groove in said couplings for governing same, vertically guided rods carrying said forked arms, two sets of coiled springs surrounding said rods and tending to hold said rods with said forked arms in their middle position, spring bolts adapted to secure said rods against unintended movement, and pairs of pattern gear controlled levers, engaging said rods and adapted to lift and lower said rods with said forked arms.

In testimony whereof I have hereunto set my hand.

HERMANN BUSCHER. [L. S.]

Witnesses:
ALERT NUFER,
HELEN NUFER.