

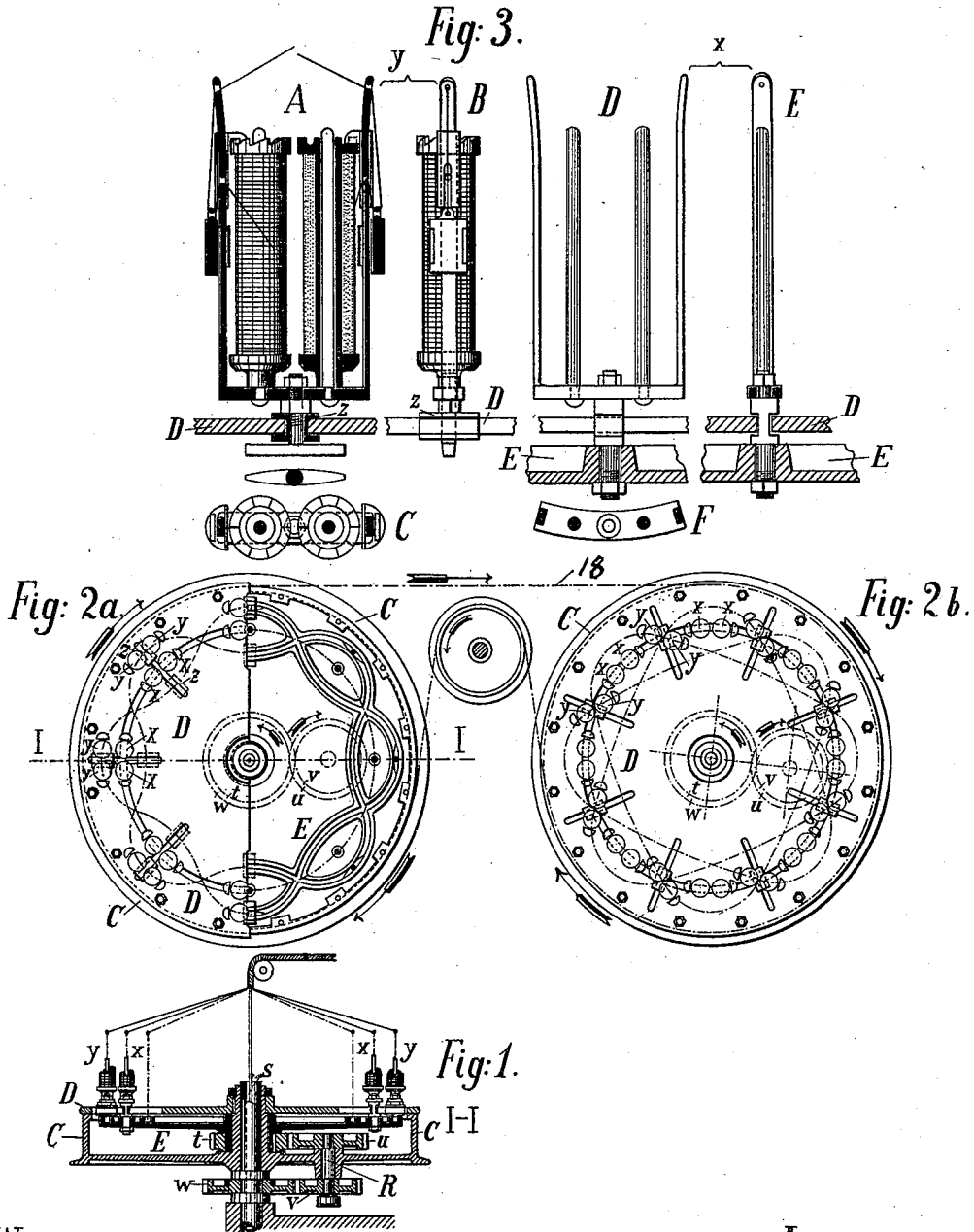
(No Model.)

4 Sheets—Sheet 1.

W. R. SCHÜRMANN.
CORD MAKING AND BRAIDING MACHINE.

No. 549,026.

Patented Oct. 29, 1895.



Witnesses:

G. Hanner
L. Frey

Inventor:

W. R. Schürmann
per
Karl J. Mayer
attorney

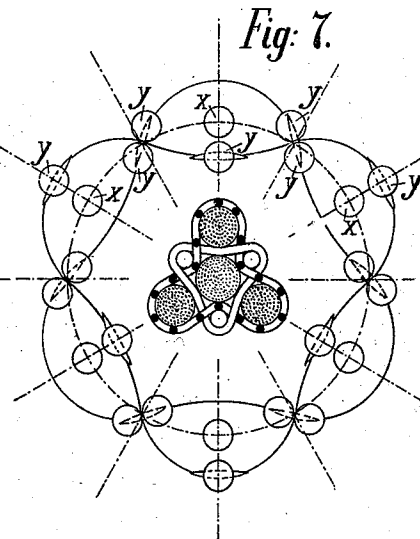
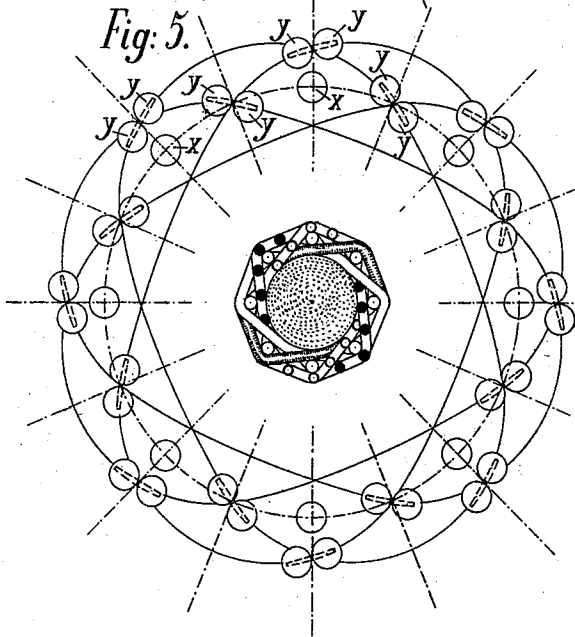
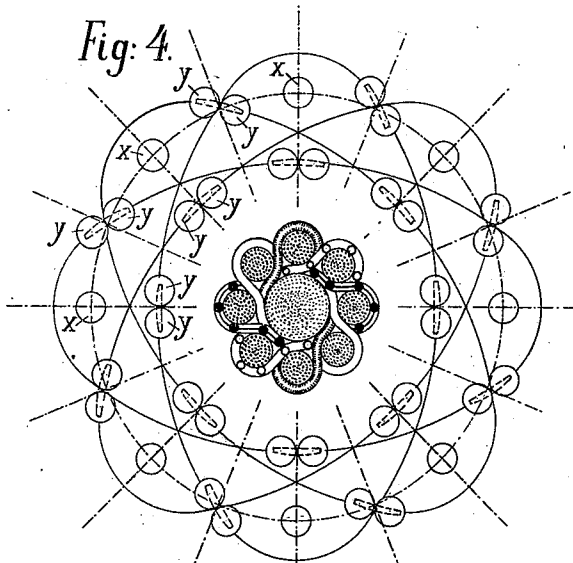
(No Model.)

4 Sheets—Sheet 2.

W. R. SCHÜRMANN.
CORD MAKING AND BRAIDING MACHINE.

No. 549,026.

Patented Oct. 29, 1895.



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(No Model.)

4 Sheets—Sheet 3.

W. R. SCHÜRMANN.
CORD MAKING AND BRAIDING MACHINE.

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Patented Oct. 29, 1895.

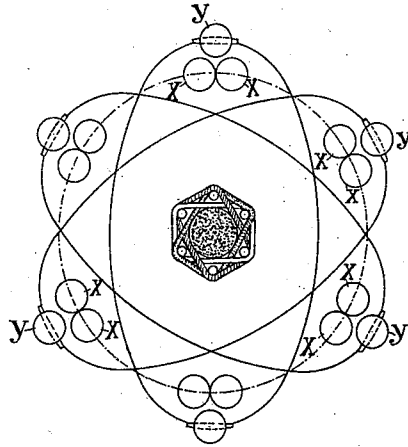


Fig: 6 b.

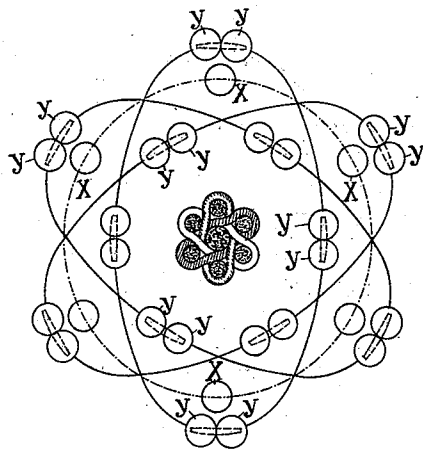


Fig: 6 a.

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(No Model.)

4 Sheets—Sheet 4.

W. R. SCHÜRMANN.
CORD MAKING AND BRAIDING MACHINE.

No. 549,026.

Patented Oct. 29, 1895.

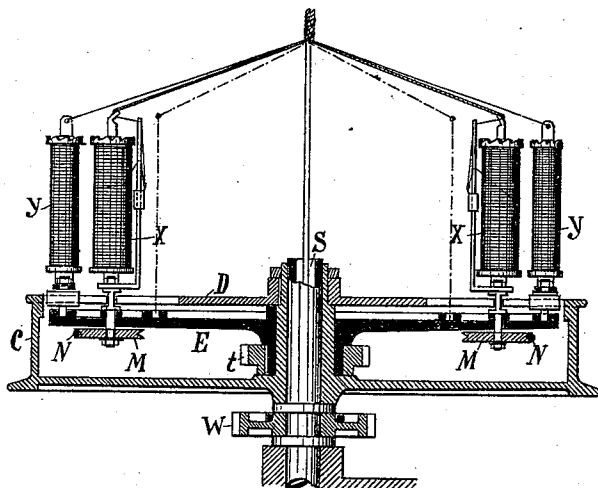


Fig: 8

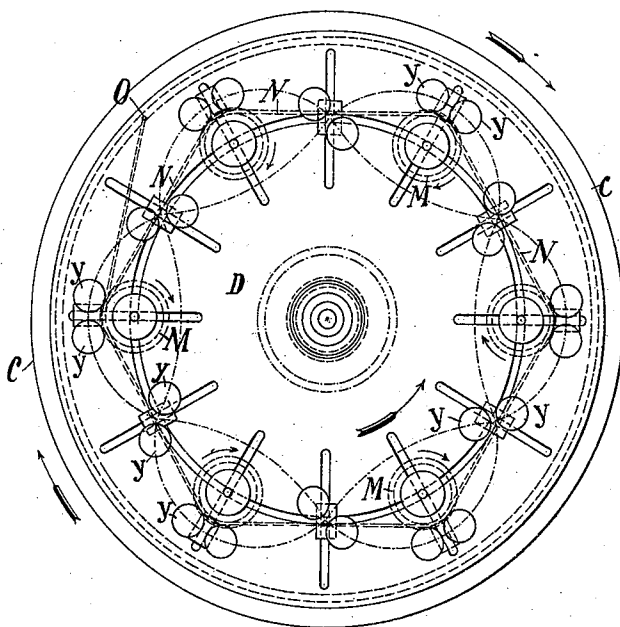


Fig: 9

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Inventor:

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UNITED STATES PATENT OFFICE.

WILHELM R. SCHÜRMANN, OF DUSSELDORF, GERMANY.

CORD MAKING AND BRAIDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 549,026, dated October 29, 1895.

Application filed December 10, 1892. Serial No. 454,801. (No model.) Patented in Germany August 9, 1892, No. 72,926; in France September 12, 1892, No. 211,089; in England October 3, 1892, No. 16,102; in Austria-Hungary October 10, 1892, No. 159; in Belgium October 12, 1892, No. 76,996; in Italy November 8, 1892, No. 32,961, and in Russia December 1, 1892, No. 13,385.

To all whom it may concern:

Be it known that I, WILHELM RICHARD SCHÜRMANN, a subject of His Majesty the Emperor of Germany, residing in the city of Düsseldorf, Rhenish Prussia, Germany, have invented a new and useful Cord Making and Braiding Machine, (for which I have obtained patents in Germany, No. 72,926, bearing date August 9, 1892; in France, No. 211,089, bearing date September 12, 1892; in England, No. 16,102, bearing date October 3, 1892; in Austria-Hungary, No. 159, bearing date October 10, 1892; in Belgium, No. 76,996, bearing date October 12, 1892; in Italy, No. 32,961, bearing date November 8, 1892, and in Russia, No. 13,385, bearing date December 1, 1892,) of which the following is a specification.

My invention relates to improvements in cord making and braiding machines in which the bobbins moving in the cam-grooves of the guide-plate run in the same direction and at the same angular speed around a common center without crossing each other, and in which the bobbin carrying the central or core threads runs in a like direction, or in the opposite direction around the center, or remains in stated positions according to the pitch of the spiral winding of the central threads. These threads are therefore crossed only by the threads which come from the bobbins which move at the same angular speed and in the same direction, and which consequently form spirals of the same pitch and direction.

A further object of my invention is to be able to produce ordinary cord, as well as to make any desirable binding of the threads, without the aid of switches and tappets, and also to make cords of a diversity of colors, which hitherto could only be accomplished by winding together the single-colored strands of a cord.

I attain these objects by the mechanical apparatus shown in the accompanying drawings, in which—

Figure 1 is a vertical section of a machine through the line I I of Fig. 2^a. Fig. 2^a is a top view of the machine, the left half of which is shown with the plate on and the right half without said plate. Fig. 2^b is a top view of

the machine with bobbins arranged in the grooves thereof. Fig. 3 embraces details of the bobbin or spool carriers. Figs. 4 and 5 show in skeleton form two examples of a machine constructed according to my system, and these figures also show, respectively, the manner in which the threads are interlaced. Fig. 6^a represents the skeleton arrangement of a machine with a fast-rotating drum and slowly-moving plate, and this figure also shows a section of a cord produced by such an arrangement. Fig. 6^b is a skeleton view of a machine with slowly-turning drum and fast-running plate and a section of a cord produced by this machine. Fig. 7 is a skeleton view of a machine with fast-running drum and slowly-moving plate carrying alternately thick and thin threads and showing a section of work produced by this arrangement. Figs. 8 and 9 are respectively a section and a plan of a machine of my system.

The merits of my invention consists in the production of a machine which is adapted to produce cords by braiding, by twisting, or by combined twisting and braiding without the use of tappets or other complicated mechanism.

For braiding there are two systems of bobbins used, one system of bobbins moving in a circular groove and the other in radial grooves, which cross circular grooves at right angles thereto, so that all the bobbins of this system move in the same direction and at the same angular speed, and that the threads of these bobbins shall cross the threads of the bobbins moving in the circular groove both in their inward and outward movements. The first system supplies the central threads. The cords thus made can be distinguished from the cords hitherto produced at a glance by the peculiar manner of the braiding. This method allows the use of two or more differentially-colored covering-threads, and therefore the making of cords of several distinctly-visible colors, because the threads of the bobbins moving in the cam-grooves cannot cross each other. It is also possible, according to my invention, to produce in the simplest way very different patterns of braided cords by

different sorts of binding, as well as by moving both systems of bobbins in the same direction at different angular speeds or in opposite directions and at any suitable and desirable speed.

On the drawings the letter S designates a vertical hollow spindle, and C a drum loosely fitted thereon. The top of the drum is provided with a plate D, which is made in two concentric parts, the inner part being fastened to the boss of the drum and the outer part secured to the rim of said drum, so that an annular groove shall be left between the two parts, as shown in Fig. 2^b. The cam-groove plate E is fitted on the middle part of the boss of the drum, so as to turn independent thereof. The means for propelling the plate E consists of change-gearing, the wheel t being secured to the plate E and the wheel w to the spindle S, the teeth of the said wheels meshing, respectively, into those of the wheels u v , which are mounted on a vertical shaft R, that is fitted in the bottom of the drum C, so as to revolve around the center thereof when the machine is in operation.

Double bobbins may be used, as shown in detail at x y in Fig. 3, or single bobbins may be used, and the taking-up apparatus may be of any known design, and is therefore not shown in the drawings. The bobbins x , which supply the central threads, are secured to the cam-plate E, so as to revolve therewith, the stems of said bobbins operating in the circular groove formed between the two concentric parts of the top plate D. The bobbins y have their frames centrally pivoted in the double-flanged slides z , which are adapted to operate to and fro in the radial slots of the plate, the said action being caused by reason of the pivots having shuttle-shaped feet, which rest in the cam-grooves, and are thereby guided. The drum C is of course adapted to turn in either direction.

Figs. 2^a and 2^b show the manner of driving two machines by a single belt 18 from an intermediate driving-pulley 17. Fig. 2^a shows a plate with single crossing cam-grooves, while Fig. 2^b represents a plate with double crossings of the cam-grooves and bobbins arranged for operating in said grooves.

If t u v w indicate the relative size of the change-gear wheels the cam-plate bobbins x will move at the same angular speed, but in opposite direction to the top-plate bobbins y .

If $\frac{u}{t} \frac{w}{v} = 2$ and a cord is produced as in ordinary cord-braiding machines, the threads crossing each other form screw lines of the same pitch, but in opposite directions.

If $\frac{u}{t} \frac{w}{v} > 2$, but > 1 —that is to say, if the quotient of the product of u times w divided by t times v be smaller or larger than 2, but greater than 1, then the spools of the cam-groove plate will run at a greater or smaller

angular speed, respectively, than the spools of the top plate and in opposite directions to same, as shown in the drawings at 1 and 2, and a cord is produced in which the threads crossing each other form screw lines of different inclinations and of opposite directions.

In the special case where $\frac{u}{t} \frac{w}{v} = 1$, where the wheels u and v , also t and w are of equal size, the cam-groove-plate spools will stand still and the spools of the top plate only will move in the ordinary manner. Thus a cord is produced in which only one part of the crossing threads run in parallel screw lines, while the other part lies in the longitudinal direction of the cord.

If, finally, $\frac{u}{t} \frac{w}{v} < 1$, but > 0 —that is to say, if the quotient of u times w divided by t times v is smaller than 1 but greater than zero, the spools of the cam-plate move in the same direction but slower than the spools of the top plate, and a cord is produced in which the threads that cross each other make screw lines of the same direction, but of different pitch. All that is to be done in order to be able to make a cord of the one sort or the other is to change either pair of wheels or only one.

It is now clear that the manner in which the threads are crossed and the binding effected depends upon the relative action of top plate and cam-plate. For any desired manner of binding one has therefore to choose the suitable cam-groove in order to produce plain cords or figured and fancy binding. In Fig. 2^a, for instance, the pairs of threads of the spools connected with the top plate will alternately cross the pairs of threads of the spools connected with the cam-plate and thus produce a braided cord resembling the line or taffeta binding.

In Fig. 2^b each pair of spools of the top plate first passes under the two pairs of threads of the spools of the cam-plate before crossing to the outside of the nearest pair of same. Thus a braid resembling the tweel is produced without the use of either tappets or switches.

The diagrams on Sheet 2 show different style of grooves and the kind of braiding produced by each.

The number of spools of the top plate should correspond with the number of radial slots in said plate. As a general thing, sixteen of each is recommended, especially in cases where the spools of the cam-plate are geared to run slower than those of the top plate, because the threads of the latter form the weft-threads of the weaving. Now, because of these grooves being endless, the spools of the plate E operating therein are surrounded only by such spools y of the plate as have their shuttles operating therein. It is therefore possible to use for the spools of the top plate running in different grooves different kinds

of thread or thread of different colors, the said threads appearing on the surface of a finished cord only at intervals, thus giving to the cord a special and distinctive appearance.

5 When the eight spools of the plate (see Fig. 4) are provided with such thickness of threads and the spools of the top plate with threads of different colors, as indicated above, so that each groove is moving a special color,
10 a core being formed, and a slowly-turning plate and fast-turning drum being employed, a braided cord of four colors is produced having the appearance of a rope corresponding in section with that shown in Fig. 4, the
15 opposite strands of this cord being in like color. In like manner, when using four different colors on the spools of the top plate and thin threads on the spools of the cam-groove plate, an octagonal cord of four shades
20 is produced, a section of which is shown, the threads being twisted and the two opposite sides alone being of a like color.

When using a fast-turning top plate and a slowly-moving cam-plate with three colors
25 on the spools of the top plate and thick threads on the spools of the cam-plate, the said cam-plate being provided with grooves, such as is shown at 6^a, a cord of the form shown at 6^a will be produced; but when using
30 slowly-moving single spools of the top plate and fast-running double spools on the cam-plate a hexagonal prismatic cord, such as shown at 6^b, is produced. The threads of each edge of the cord in this case are twisted, and
35 the opposite sides alone correspond in color.

Fig. 7 is an example showing how with a fast-running drum and slowly-moving cam-plate the spools thereon may be provided alternately with thick and thin threads in order
40 to produce a cord of two colors, of form shown at Fig. 7. These examples serve to show how my machine can be used to produce different cords, and attention is called to the fact that in all grooves the top-plate
45 spools *y* operate around a common center. It is also to be observed that with this machine all the spools *x*, especially when made single, can be arranged to turn around their axis on the plate E.

50 The lower end of the spool-spindles may be provided with a rope-pulley M (see Figs. 8 and 9 instead of a screw-nut, as shown in other figures,) an endless cord N', arranged around all the pulleys, and a connection made
55 with the periphery of the drum C, as at O, so as to be pulled around by the drum. By this means all the pulleys M will revolve and

thus cause the threads from the spools thereon to be twisted, and in this way producing a regularly-twisted cord, the strands of which
60 are firmly bound together by alternately laying above and below same the other threads. By this arrangement all the spools, as well as the pulley M, are made to revolve on their axis, the motion being imparted to the spools
65 by reason of the tension on the threads thereof.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

70 1. In a cord making and braiding machine, the combination of a hollow-spindle, a drum loosely fitted thereon, a top-plate composed of two concentric parts, secured respectively to the rim and boss of the drum, having an annular groove between the concentric parts,
75 and having a series of radial-grooves intersecting the annular groove, at right angles, as described, with a cam-groove plate loosely fitted on the boss of the drum so as to turn independently thereof, and spool-bobbins arranged for operating in the grooves of the top-plate and cam plate, substantially as described.

2. The combination in a cord making and
85 braiding machine, of a drum and hollow spindle, a top-plate with annular groove therein and radial grooves at right angles to the annular groove, a cam-plate adapted to operate around the hub of the drum, a shaft vertically arranged in the bottom of the drum,
90 and change gear for operating the cam-plate, so that the warp-threads, and weft-threads shall be carried in opposite directions and at different speeds, substantially as and for the
95 purpose set forth.

3. The combination in a cord making and braiding machine, of a vertical hollow spindle, a drum adapted to rotate thereon, the drum provided with a top plate having an annular groove, and radial grooves at right angles thereto, a cam-plate adapted to rotate around the hub of the drum, change-gear as described, for transmitting motion to the cam-plate, an endless cord surrounding the
105 cord-wheels, a cord connecting the endless cord with the periphery of the drum, and spool-bobbins arranged above the cord-wheels, substantially as and for the purpose set forth.

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Witnesses:

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