No. 871,004. PATENTED NOV. 12, 1907.

F. THUN.

BRAIDING MACHINE.

APPLICATION FILED MAY 11, 1906.

3 SHEETS—SHEET 1.

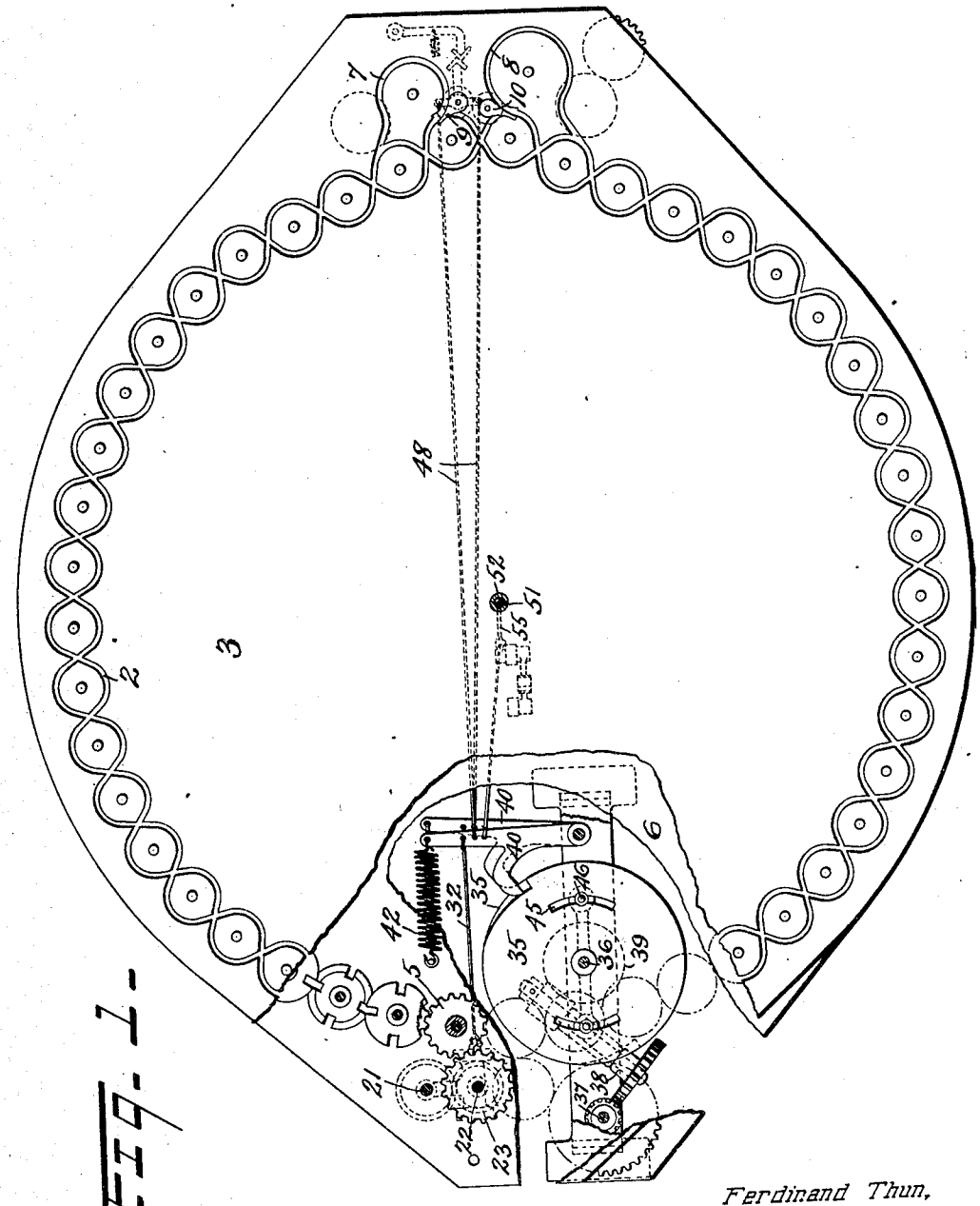


Fig. 1.

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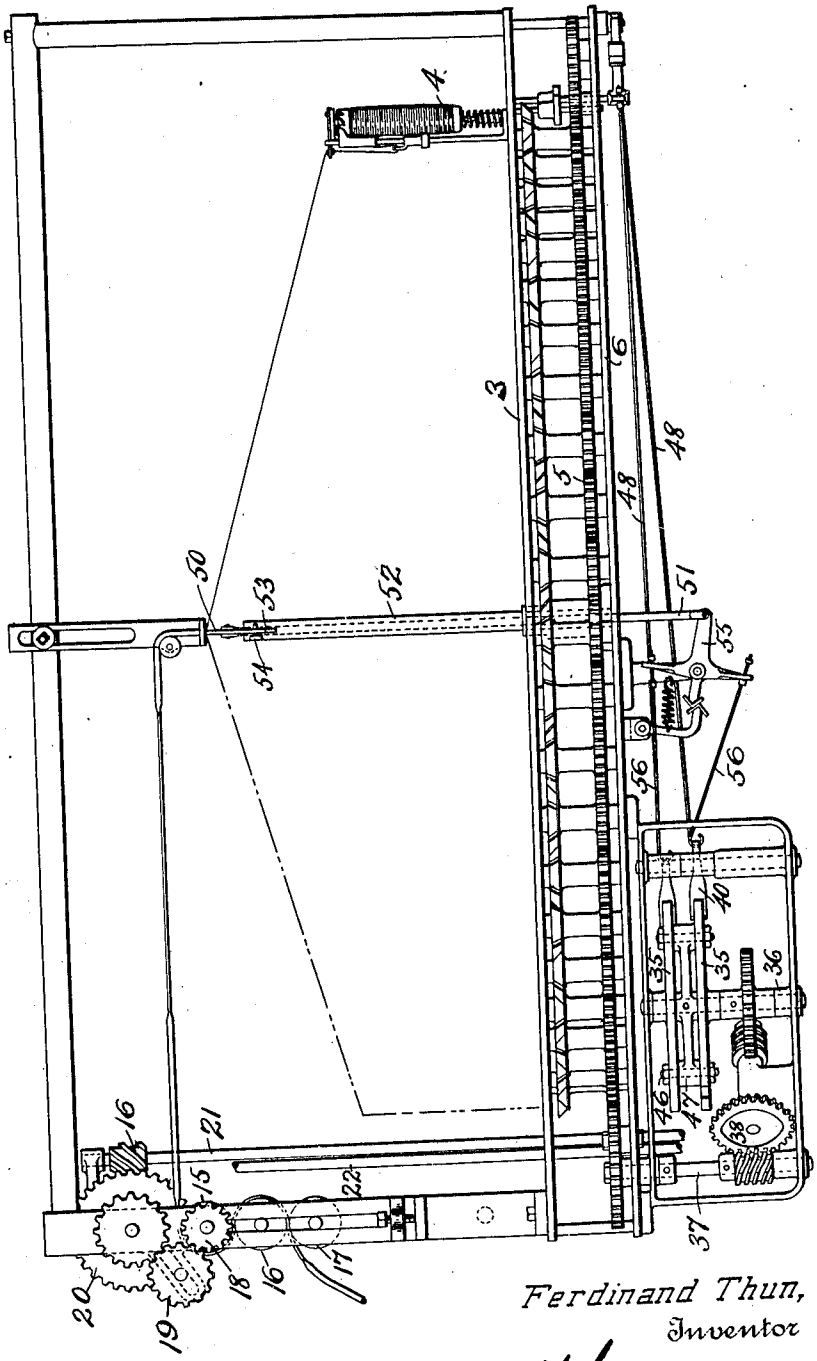
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

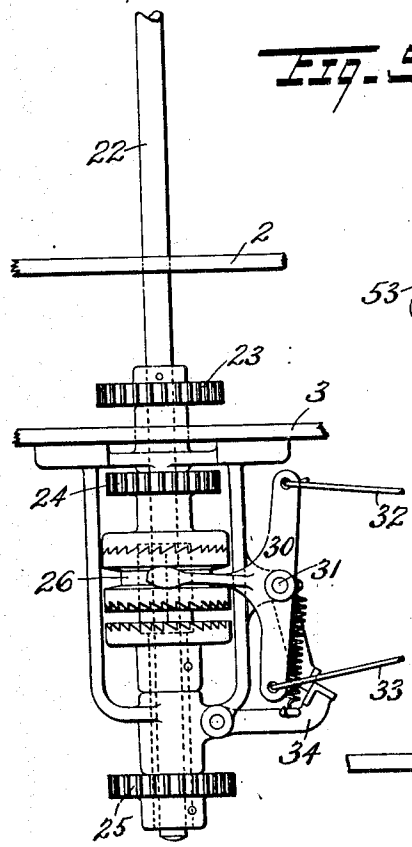


Fig. 5.

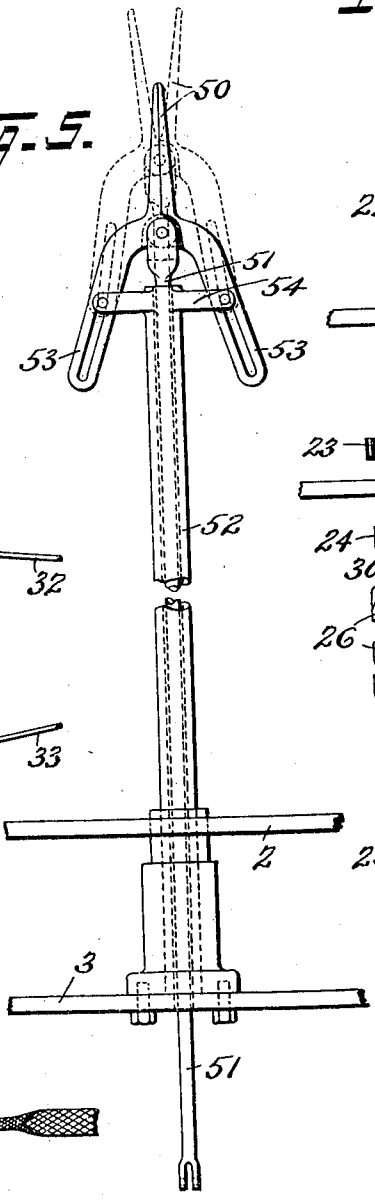


Fig. 4.

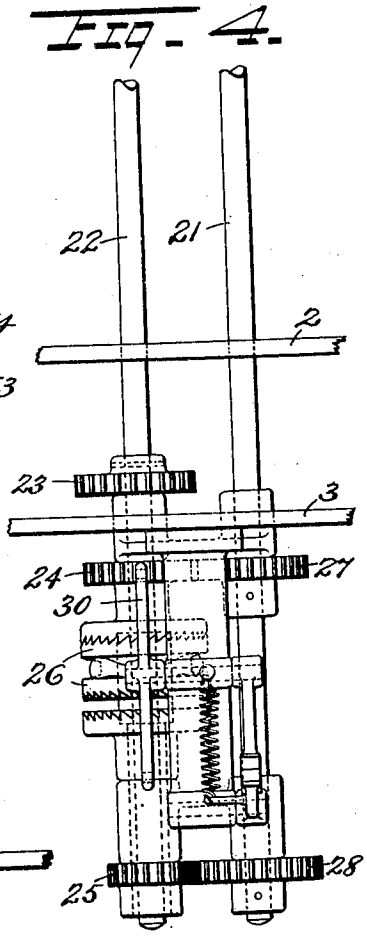


Fig. 6.



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UNITED STATES PATENT OFFICE.

FERDINAND THUN, OF WYOMISSING, PENNSYLVANIA, ASSIGNOR TO TEXTILE MACHINE WORKS, OF WYOMISSING, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BRAIDING-MACHINE.

No. 871,004. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed May 11, 1906. Serial No. 316,237.

To all whom it may concern:

Be it known that I, FERDINAND THUN, a citizen of the United States, and a resident of Wyomissing, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Braiding-Machines, of which the following is a specification.

My invention relates to certain improvements in braiding machines whereby a product of varying form and compactness may be continuously produced, particularly such as described in my pending application, Ser. No. 258,037, filed April 29, 1905, for improved shoe lacing.

The invention provides for securing a variable-speed take-off, and for properly forming alternate tubular and flat braid portions in a continuous product and with varying texture; and is fully described in connection with the accompanying drawings, the novel features being specifically pointed out in the claims.

Figure 1 is a plan view of the main portion of a braiding machine embodying my improvements in preferred form; portions of the top and bottom plates being broken away to show more clearly certain of the mechanism. Fig. 2 is a corresponding elevation showing also the spreader mechanism and the take-off mechanism, omitted in Fig. 1. Fig. 3 is a separate enlarged view of the lower portion of the take-off drive shaft with its clutch mechanism; and Fig. 4 is a corresponding view, at right angles to Fig. 3, showing the intermediate meshing shaft. Fig. 5 is a detail view of the spreader mechanism. Fig. 6 indicates a product of my improved machine.

The race-way 2 in the upper plate 3, for the carriers 4, forms an unbroken circle adapted for producing tubular braid; a continuous intermeshing series of drive gears 5 being located as usual between the top plate 3 and bottom plate 6. In order to change the product from tubular to flat braid when desired, I provide a pair of side-track terminal circles 7 and 8, into which the carriers may be diverted by means of switches 9 and 10 respectively; these side-track terminals being located as shown, so as to cut out two of the circles of the circular race-way, and being provided with drive gears having respectively one less and one more carrier-engaging "horns" than the drive gears of the main circular series, so as to just equal the number of "horns" in the two of the latter that are cut out. By this means a perfect braid of either tubular or flat form may be made by simply reversing the switches.

The take-off mechanism comprises the usual series of rolls 15, 16, and 17 with suitable drive gears 18, 19 and 20, the latter of which is driven by a worm 76 on the vertical drive-shaft 21. This shaft, instead of being driven directly from the train of carrier gears at a fixed speed, as usual, is driven indirectly at different speeds as desired, by an intermediate shaft 22, so as to vary the speed of the take-off; the object being to thus correspondingly vary the tightness of the fabric at different portions. The shaft 22 is provided with a fixed gear wheel 23 in mesh with the carrier gears, and with loose gears 24 and 25 of different diameters, either one of which may be caused to rotate with the shaft by proper movement of an intermediate clutch 26, so as to rotate the take-off drive-shaft 21 at correspondingly different speed through the smaller gear 27 or the larger gear 28 as the case may be. The clutch 26 is moved as shown by a lever 30 pivoted at 31 and arranged to be positively swung in opposite directions by tension rods 32 and 33, with a spring-latch 34 holding the same in either position.

The changing of the take-off speed is controlled as shown by cam wheels 35 35 on shaft 36, to which rotary movement is imparted from the train of carrier gears, through vertical worm shaft 37 and horizontal worm shaft 38, the latter arranged in mesh with the cam gear 39. The cam wheels are thus rotated very slowly in connection with the braiding mechanism, the relative speed being such that a determined section of braid is produced for each rotation of the cam wheels; and the latter being adapted to operate the clutch 26 once in each direction for each rotation so that such determined section of braid will be made at two different speeds of take-off. The means through which the cam wheels are adapted to operate the clutch comprise pivoted levers 40 having fingers 41 held in contact by springs 42 with the notched periphery of the cam wheels so as to be periodically vibrated by the latter, such motion being transmitted to the clutch 26 through the previously mentioned tension rods 32 33. In order that the relative times of the respective clutch movements may be varied so as to vary the relative lengths of the tighter and looser braided portions of each braid section, the cam wheels 35 35 are made adjustable relative to each other by providing them with curved slots 45 through which pass the clamping bolts 46 securing them to the intermediate carrier arm 47.

The switches 9 and 10 for determining the courses of the carriers as required respectively for flat and tubular braiding, are likewise operated by the levers 40, as indicated, so that the change of braiding and change of take-off are simultaneously effected; this being accomplished by means of connecting rods 48 48 extending from said levers to the switch spindles, as indicated.

To provide for symmetrically spreading the flat braiding, and its junction with the tubular braiding, I preferably employ a spreading device comprising a pair of fingers 50 pivotally mounted upon a vertically movable rod 51 guided in a hollow central column 52 of the machine; said fingers being projected upward through the braiding opening and simultaneously spread apart by raising said rod, and reversely acted

upon by lowering the same, the spreading and closing together of the fingers being effected as shown by engaging the slotted finger extensions 53 with fixed arms 54 on the column 52. The rod 51 is raised or lowered as required to throw the spreading device into or out of action by means of a lever 55 connected by rods 56 to the cam levers 40 so as to be operated simultaneously with the switch and take-off clutch mechanisms.

In forming the braid product indicated in Fig. 6 of the drawings the flat end portions will be loosely braided with the faster speed take-off and the spreader in operation, while the intermediate narrowed portion will be more tightly braided with the slower speed take-off and the spreader lowered. The braiding of this intermediate portion may evidently be tightened also without changing such portion to tubular form if desired by merely locking the switches in position to uniformly divert the carriers into the terminal side-track cricles.

The preferred mechanism specifically described may obviously be modified without departing from the invention.

What I claim is:—

1. A braiding machine having a take-off mechanism and an operating mechanism therefor comprising means for varying the speed of the take-off during different periods of the braiding operation.

2. In a braiding machine for forming alternately flat and tubular braid the combination of a switch mechanism, a take-off mechanism, and a switch operating mechanism arranged to simultaneously change the speed of the take-off mechanism.

3. In a braiding machine for forming alternately flat and tubular braid the combination of a switch mechanism, a take-off mechanism, a movable spreader-rod, and a switch operating mechanism arranged to simultaneously operate said spreader rod and to change the speed of the take-off mechanism.

4. In a braiding machine for forming alternately flat and tubular braid the combination of a switch mechanism, a movable spreader-rod and a switch operating mechanism arranged to simultaneously operate said spreader-rod and switch mechanism.

5. In a braiding machine having a variable speed take-off, an operating mechanism therefor comprising a variable speed drive-shaft, an intermediate shaft having different-sized gears engaging said drive-shaft, and a clutch mechanism comprising a rotary cam wheel and clutch operating lever substantially as set forth.

6. A braiding machine having a variable speed take-off and an operating mechanism therefor comprising a change-controlling cam wheel arranged in gear with the braiding mechanism substantially as set forth.

7. A braiding machine having a variable speed take-off and an operating mechanism therefor comprising a pair of relatively adjustable change-controlling cam wheels arranged in gear with the braiding mechanism substantially as set forth.

8. In a braiding machine for forming alternate flat and tubular braid, a spreader mechanism comprising a vertically movable spreader rod, a guide column therefor, and spreader fingers pivotally carried by said rod and connected to said column so as to be operated by the movement of the rod, substantially as set forth.

9. In a braiding machine for forming alternate flat and tubular braid, the combination of a take-off mechanism, a switch mechanism, a spreader mechanism, and means for simultaneously operating said switch and spreader mechanisms substantially as set forth.

10. In a braiding machine for forming alternate flat and tubular braid, the combination of a variable-speed take-off mechanism, a switch mechanism, a spreader mechanism, and means for simultaneously changing the speed of the take-off and operating said switch and spreader mechanisms, substantially as set forth.

In testimony whereof, I affix my signature, in the presence of two witnesses.

FERDINAND THUN.

Witnesses:
D. M. STEWART,
W. G. STEWART.