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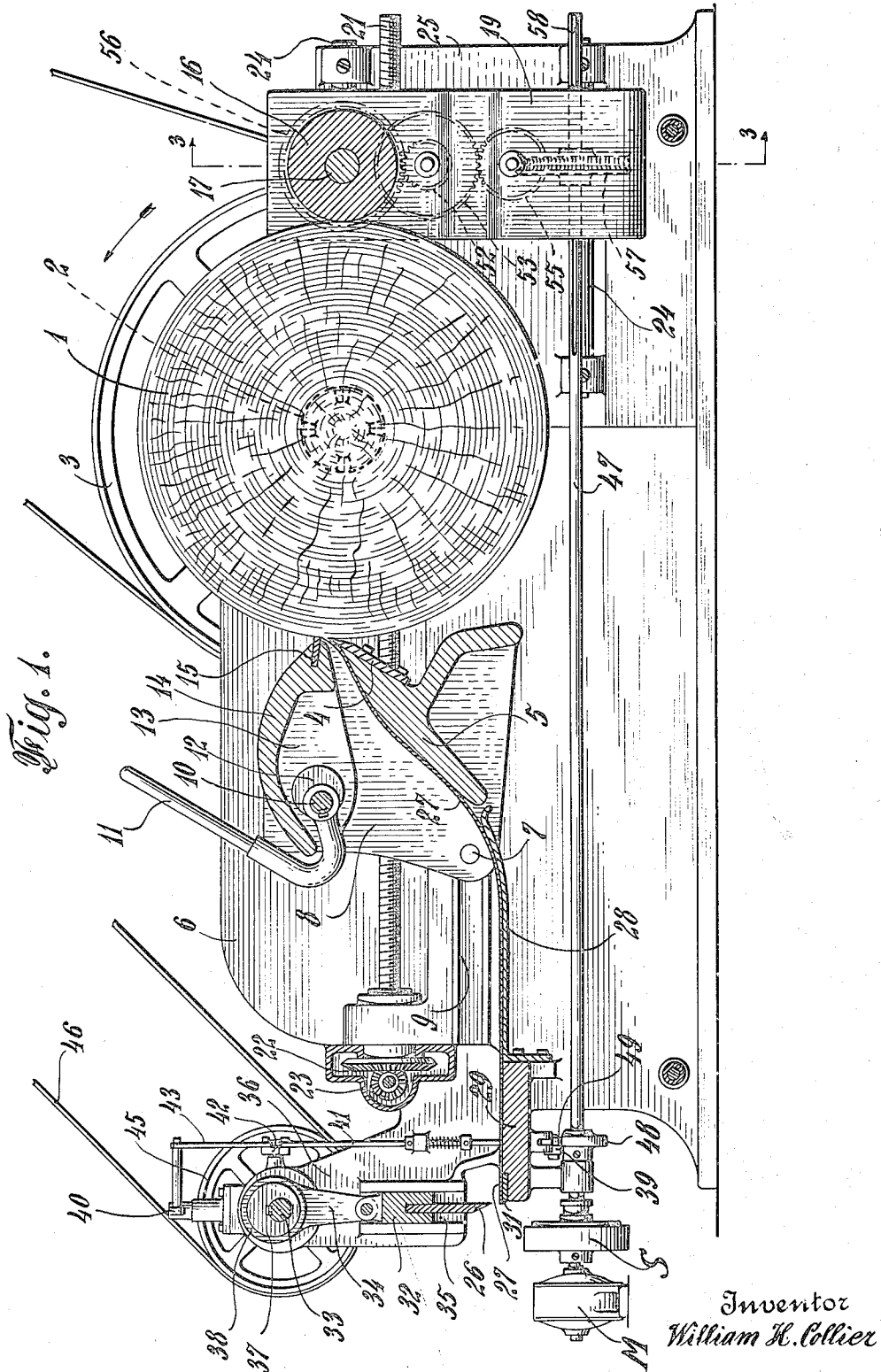
W. H. COLLIER

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MECHANISM FOR SYNCHRONIZING MECHANICAL MOVEMENTS

Filed Oct. 24, 1921

2 Sheets-Sheet 1



By his Attorney

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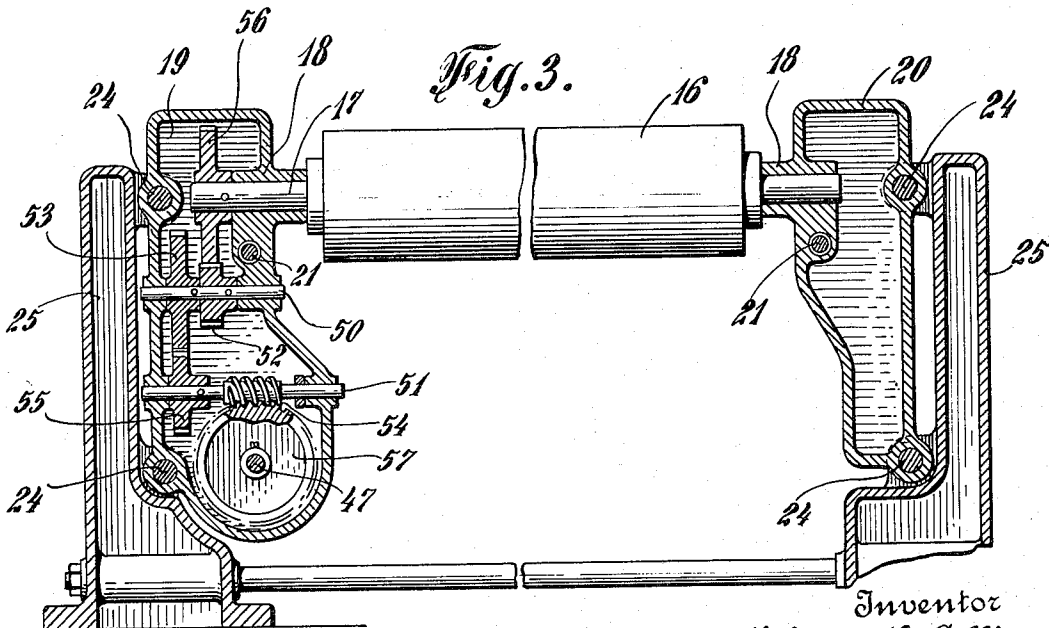
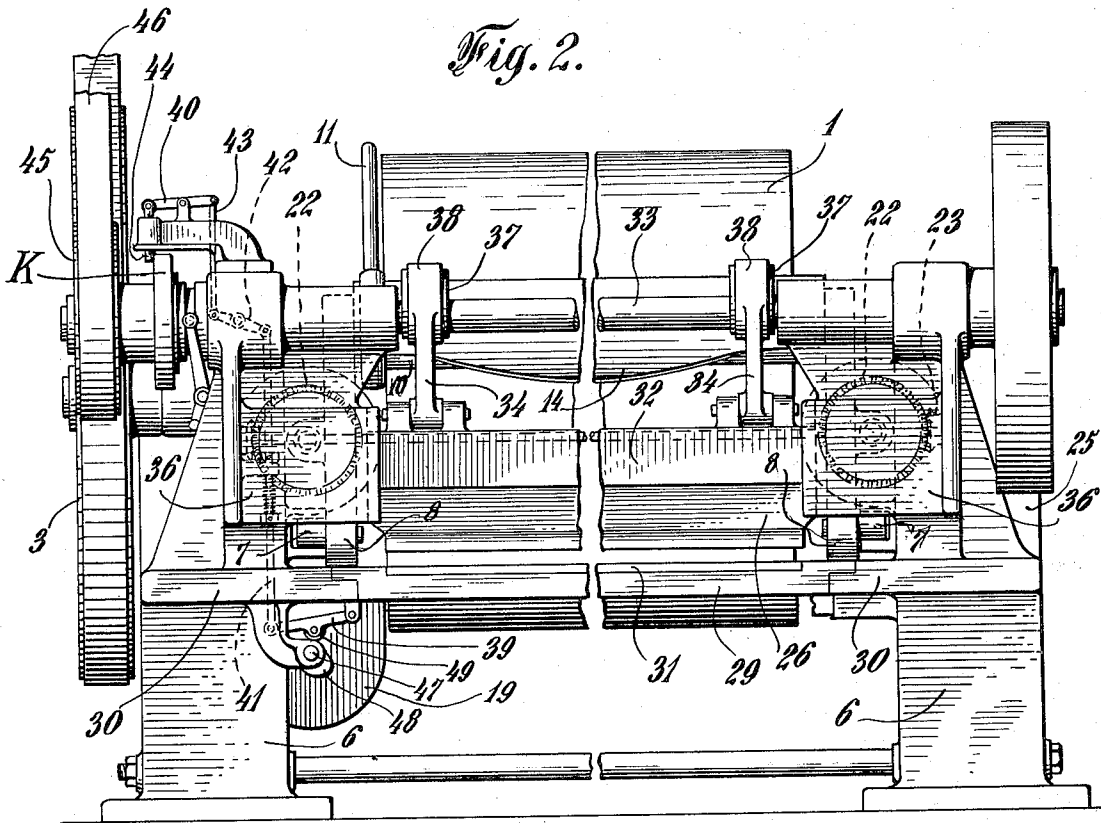
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UNITED STATES PATENT OFFICE.

WILLIAM H. COLLIER, OF PAINESVILLE, OHIO.

MECHANISM FOR SYNCHRONIZING MECHANICAL MOVEMENTS.

Application filed October 24, 1921. Serial No. 510,080.

To all whom it may concern:

Be it known that I, WILLIAM H. COLLIER, a citizen of the United States, and a resident of Painesville, Lake County, State of Ohio, have invented certain new and useful Improvements in Mechanism for Synchronizing Mechanical Movements, of which the following is a specification.

The object of my invention is to provide automatic means for synchronizing the movements of certain parts in machines where there is no driving connection between those parts and where it is necessary to time the operation of one part in accordance with the changing speed of operation of another part. As an illustration of the applicability of my invention, I may mention veneer-cutting machines. In these machines, as is well known, a knife cuts veneer from a continuously rotating log. As the log is cut away, its surface speed gradually decreases and the veneer is fed through the machine at a correspondingly lower rate of speed.

Now, when it is desired to cut the veneer into sheets of predetermined length, it is obvious that the operation of the cutter or clipper must always be timed with the rate at which the veneer is fed to the cutter. In other words, as the veneer is fed more slowly to the cutter, the time interval between successive operations of the cutter must be increased correspondingly in order to produce sheets of substantially the same length. It will be understood that in these veneer machines the device which cuts the veneer crosswise into sheets cannot be operated by power derived from the rotating log itself. An independent source of power is, therefore, necessary for the cutter, and it is the purpose of my invention so to control this source of power that the cutter at all times operates in synchronism with the continually changing surface speed of the log.

Broadly speaking, my invention is applicable in machines having a rotatable roll or cylinder of a material adapted to be cut away or removed in sheets and where there is a device which acts upon a sheet at intervals which must be uniform as measured in length upon the sheet. The cylinder or roll may be a log from which veneer is cut, and the intermittently operating device may be a knife for cutting the veneer in sheets, as above mentioned. Or, the rotatable cylinder may be a roll of paper or like material

adapted to be unwound in sheets, and the intermittently acting device may be a cutting, scoring or marking member adapted to perform a certain operation upon the sheet at certain distances apart as the sheet is unwound. These are merely a few of the instances which I mention by way of illustration to indicate the wide use of my new synchronizing mechanism.

The objects and advantages of my invention will be best understood from a detailed description of the accompanying drawings, which show an illustrative embodiment of my invention. In these drawings I have shown my invention applied to a veneer-cutting machine, it being understood that this is merely for the sake of explaining the principles of my invention, and not by way of limitation. In these drawings,

Figure 1 is a longitudinal cross-section of a veneer-cutting machine having a synchronizing mechanism constructed in accordance with my invention;

Fig. 2 is an end view of the machine shown in Fig. 1, looking from left to right; and

Fig. 3 is a transverse cross-section approximately on line 3—3 of Fig. 1.

As is usual in veneer-cutting machines, a log of wood 1 is adapted to be clamped between a pair of chucks, one of which is indicated by the dotted lines 2 in Fig. 1. The chucks which hold the log in position are rotated from any suitable source of power indicated diagrammatically by a pulley 3. A knife 4 is carried by a frame 5, usually called a knife bar, which is mounted between the sides 6 of the general framework of the machine. The knife bar 5 is provided with a pair of rollers 7 in the side plates 8. The rollers 7 engage in grooves or channels 9 in the sides of the framework. In this way the knife bar 5 is slidably mounted relatively to the log. Mechanism is usually provided for automatically adjusting the position of the knife as the log is cut down, so as to produce veneer of substantially uniform thickness. This automatic knife-adjusting mechanism is an old and well-known contrivance and I do not, therefore, consider it necessary to show the same, particularly since it forms no part of my present invention. Between the plates 8 of the frame or knife bar 5 is a shaft 10 adapted to be operated by a handle 11. On the shaft 10

are fixed cam disks 12 which fit in openings in the sides 13 of the frame 14. In the front edge of the frame 14 is mounted a pressure bar 15. By operating the handle 11 the pressure bar 15 is moved toward and from the log. The pressure bar 15 is arranged to press against the rotating log along a line slightly in advance of the veneer knife 4. This is an ordinary construction in veneer machines, and I need say nothing more about it, because the same is well understood and does not form part of my invention.

A roller 16, preferably of steel, presses against the log along a line approximately diametrically opposite the cutting line of the knife. The precise point at which the roller 16 engages the log is immaterial. The roller 16 is carried by a shaft 17 mounted in suitable bearings 18 of supporting members 19 and 20, as best shown in Fig. 3. In the present instance, I have shown the member 19 in the form of a casing adapted to house certain gear connections to be presently explained. The roller 16 is held against the rotating log 2 by any suitable means. In the drawings there is a pair of adjustable screw rods 21 arranged longitudinally at the sides of the machine. Each of the rods 21 carries a bevel gear 22 arranged to mesh with a bevel pinion 23. As seen from Fig. 1, the rods 22 have right and left handed screw threads which engage correspondingly threaded openings in the knife bar 5 and the supporting members 19 and 20 of the roller 16. As a result of this arrangement, when the rods 21 are turned in one direction, the knife bar 5 and supporting framework of the roller 16 are moved against the log in opposite directions. The supporting members 19 and 20 are guided in their movements to and from the log by suitable guide rods 24 mounted on the side pieces 25 of the machine. The operation of the rods 21 to hold the knife 14, pressure bar 15 and roller 16 pressed against the rotating log during the veneer-cutting operation is entirely automatic. For the purposes of this case it is sufficient to say that the bevelled pinions 23 are automatically operated to turn the screw rods 21. The connections for so operating the bevelled pinions 23 are old contrivances in veneer machines and do not in and of themselves form part of my invention. As previously stated, the roller 16 may be held pressed against the rotating log by any mechanism adapted to that end.

At the front end of the machine is mounted a vertically reciprocable cutter or clipper 26 arranged to cut the veneer transversely into sheets of predetermined length. Referring to Fig. 1, as the veneer 27 is cut from the log, it passes over the upper surface of the knife bar 5 onto a table formed by members 28 and 29. The member 29 may be in the form of a

heavy flat bar supported at its ends on the projections 30 of the framework, as shown in Fig. 2. The crossbar 29 is usually provided with a cutting edge 31 adapted to cooperate with the cutter 26 in cutting the veneer. The cutter 26 is mounted in a block 32 connected to a shaft 33 by pivoted links 34. The ends of the knife block 32 slide in grooves 35 formed in extensions 36 of the general framework of the machine. The shaft 33 carries a pair of cam disks 37 which fit in the collars 38 of the links 34. It will be seen from this that as the shaft 33 is rotated, the cutter 26 moves up and down. For every revolution of the shaft 33 the cutter 26 moves down to cut the veneer and is then withdrawn into the position shown in Fig. 1.

It is immaterial by what means the shaft 33 is operated. In the drawings I have shown a well-known tripping device, such as is used in punching presses, for operating the shaft 33. This tripping device includes a cam-actuated lever 39 connected to a tripping lever 40 by means of the usual links 41, 42 and 43. The lever 40 carries a tripping pin 44 adapted to trip a clutch K of well-known construction. A pulley 45 is continuously rotated by a belt 46. As long as the clutch K is held back by the pin 44 there is no movement of the cutter shaft 33. When the pin 44 is drawn away from the clutch K, the shaft 33 becomes automatically coupled to the pulley 45 and is rotated. This operative connection lasts just long enough to impart a complete revolution to the shaft 33 and thus moves the cutter 26 into and out of cutting position.

The foregoing driving connections for the shaft 33 are well-known expedients and are referred to merely for the sake of illustration. In the broader aspect of my invention, the operating means for the periodically actuated member 26 may be considered as represented by a member 47, which in this instance is a rotatable shaft mounted lengthwise in the framework of the machine. The shaft 47 carries a cam 48 arranged to engage a roller 49 of the lever 39. As the shaft 47 revolves the cam 48 raises the lever 39, thereby tripping the clutch K and causing operation of the shaft 33, as previously explained. It is immaterial whether the shaft 47 is a positive actuating means for the cutter 26 or acts as a means for controlling the operative connection between the shaft 33 and a source of direct driving power, such as the pulley 45. The shaft 47 is operated from a suitable source of power, such as an electric motor diagrammatically indicated at M. Between the motor M and the shaft 47 is interposed an ordinary slip clutch S, or other yieldable connection, which permits regulation of the speed of the shaft 47 independently of the driving motor M.

I will now describe the connections between the roller 16 and the shaft 47 for controlling the speed of rotation of the shaft 47 in accordance with the speed of the roller, which always operates at the surface speed of the log 1. These connections are shown in Fig. 3. In the chamber formed by the casing 19 are mounted countershafts 50 and 51. On the shaft 50 are fixed a pinion 52 and a gear 53. On the shaft 51 are rigidly mounted a worm 54 and a pinion 55. One end of the shaft 17 of the roller 16 extends into the casing 19 and carries a gear 56 arranged to mesh with the pinion 52. The gear 53 meshes with the pinion 55 and the worm 54 meshes with a gear 57 mounted on the shaft 47 so as to rotate therewith. A slot 58 in the shaft 47 permits the gear 57 to slide longitudinally of the shaft when the supporting members 19 and 20 are adjusted with respect to the log, as previously described. The engagement between the worm 54 and worm gear 57 is such that the worm gear 57 cannot drive the worm 54, but the worm 54 is always free to turn. In other words, the worm gear 57 cannot turn any faster than the worm 54 allows. As a result, the shaft 47 must always turn at the same relative speed as the roller 16. Since the shaft 47 either operates or controls the cutter 26, it is clear that the intermittent operations of the member 26 will always be synchronous with the continuously changing surface speed of the rotatable member 1, which in the present case is a log of wood. Because of this automatic synchronizing, the sheets cut off by the cutter 26 are approximately the same length regardless of the continually decreasing diameter of the log. The length of the sheets is predetermined by adjusting the operative controlling connections between the shaft 47 and the cutter shaft 33, as will be understood by any skilled mechanic.

Although I have herein set forth a machine of specific construction, it is obvious that the basic principles of my invention may be mechanically embodied in various ways without departing from the scope of my invention as defined in the appended claims. As far as I am aware, I am the first to produce wholly mechanical means for synchronizing two independently driven parts of a machine, and I desire to claim this idea in a fundamental way.

What I claim as my invention is:

1. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a roller arranged to press against said member so as to rotate at the varying surface speed of said member, a device for intermittently acting upon the sheet, means independent of said roller for actuating said device, and means for auto-

matically controlling the operation of said actuating means in synchronism with the speed of operation of said roller.

2. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a rotary shaft, means for driving said shaft, a device controlled by said shaft for periodically acting upon the sheet, and mechanism independent of said driving means for automatically controlling the speed of said shaft in synchronism with the varying surface speed of said member.

3. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a roller arranged to press against said member so as to rotate at the varying surface speed of said member, a reciprocable device for cutting the sheet transversely into sections, means independent of said roller for actuating said device, and means for automatically controlling the operation of said actuating means in synchronism with the speed of operation of said roller, whereby the sections cut by said device are of substantially equal length.

4. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a rotary shaft, means for driving said shaft, a reciprocable device controlled by said shaft for cutting the sheet transversely into sections, and mechanism independent of said driving means for automatically controlling the speed of said shaft in synchronism with the varying surface speed of said member.

5. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a roller arranged to press against said member so as to rotate at the varying surface speed of said member, a device for intermittently acting upon the sheet, a rotatable shaft, means independent of said roller for driving said shaft connections between said shaft and said device for intermittently operating said device, and connections between said shaft and said roller for automatically controlling the operation of said shaft in synchronism with the speed of operation of said roller.

6. In a machine having a rotary member adapted to operate at a varying surface speed, the combination of a roller pressed against the periphery of said member so as to rotate always at the surface speed of said member, a rotatable shaft, means independent of said roller for operating said shaft, and means for automatically controlling the operation of said shaft in synchronism with the varying speed of operation of said roller.

7. In a machine having a rotary member adapted to operate at a varying surface

- speed, the combination of a roller pressed against the periphery of said member so as to rotate always at the surface speed of said member, a rotatable shaft, means independent of said roller for operating said shaft, and a coupling between said shaft and said roller for compelling said shaft to rotate always in synchronism with the varying speed of operation of said roller.
8. Synchronizing mechanism comprising, in combination, a rotary member, a second rotary member, means independent of said second member for rotating said first member at a variable rate of speed, means independent of said first member for rotating said second member, and means solely mechanical for synchronizing the speed of rotation of said second member with the variable speed of rotation of said first member.
9. In a machine having a rotary member adapted to operate at a varying surface speed, the combination of a roller pressed against the periphery of said member so as to rotate always at the surface speed of said member, a rotatable shaft, means independent of said roller for operating said shaft, a worm driven by said roller, and a worm gear driven by said shaft and permanently in mesh with said worm, whereby said shaft is compelled to rotate always in synchronism with said roller.
10. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a roller arranged to press against said member so as to rotate at the varying surface speed of said member, a device for intermittently acting upon the sheet, a rotatable shaft, connections between said shaft and said device for intermittently operating said device, a worm driven by said roller, and a worm gear driven by said shaft and permanently in mesh with said worm, whereby said shaft is compelled to rotate always in synchronism with said roller.
11. In a machine having means to rotate a cylindrical member of a material adapted to be cut away or removed in sheets, the combination of a roller arranged to press against said member so as to rotate at the varying surface speed of said member, a device for intermittently acting upon the sheet, a rotatable shaft, a source of power for operating said shaft, a yieldable coupling between said source of power and said shaft, a worm gear fixed on said shaft, and a worm driven by said roller and permanently meshing with said worm gear, whereby said shaft is compelled to rotate always in synchronism with said roller.

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