

June 26, 1956

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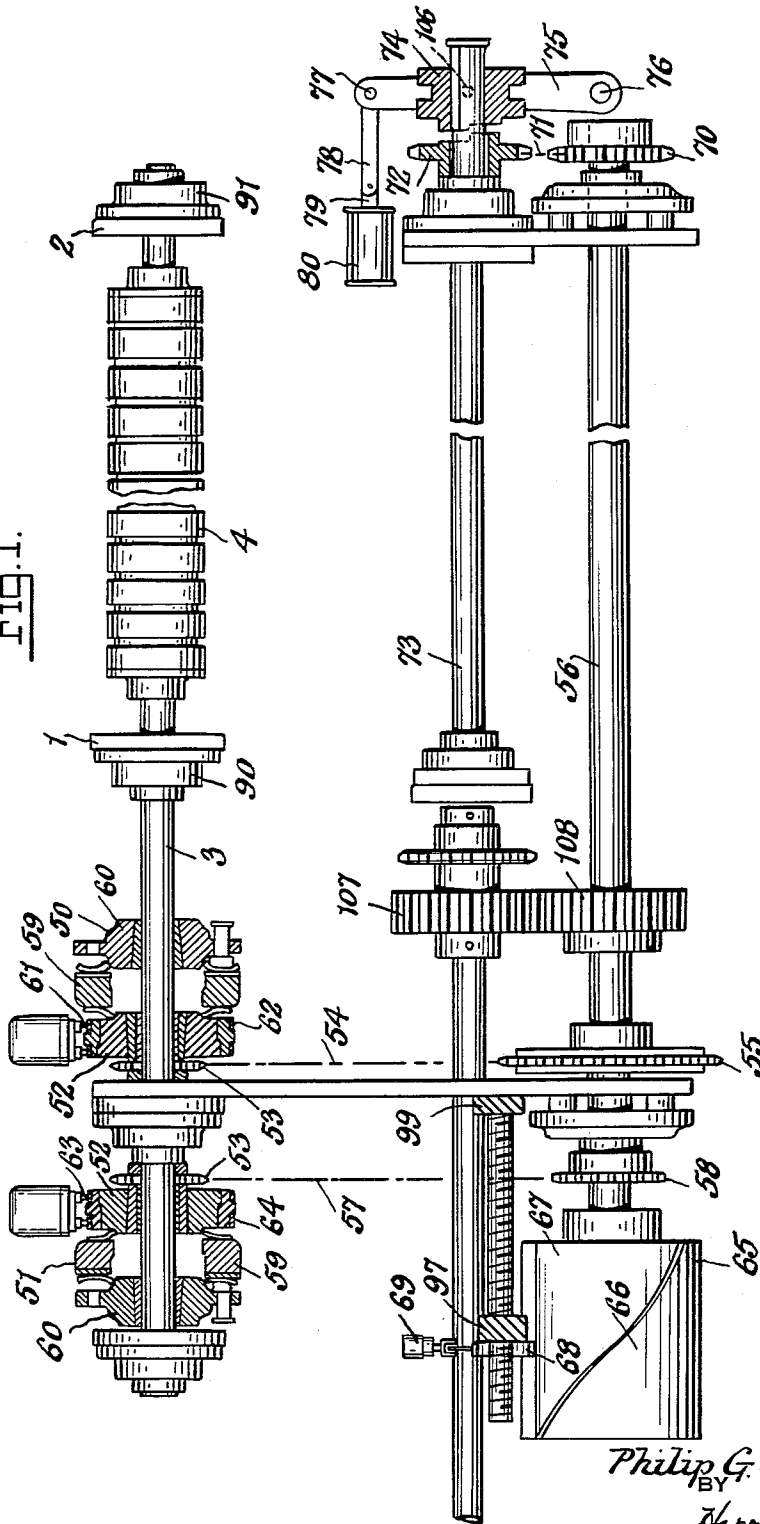
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SHEET MATERIAL FEEDING AND CUTTING APPARATUS

Filed Jan. 18, 1954

4 Sheets-Sheet 1

Fig. 1.



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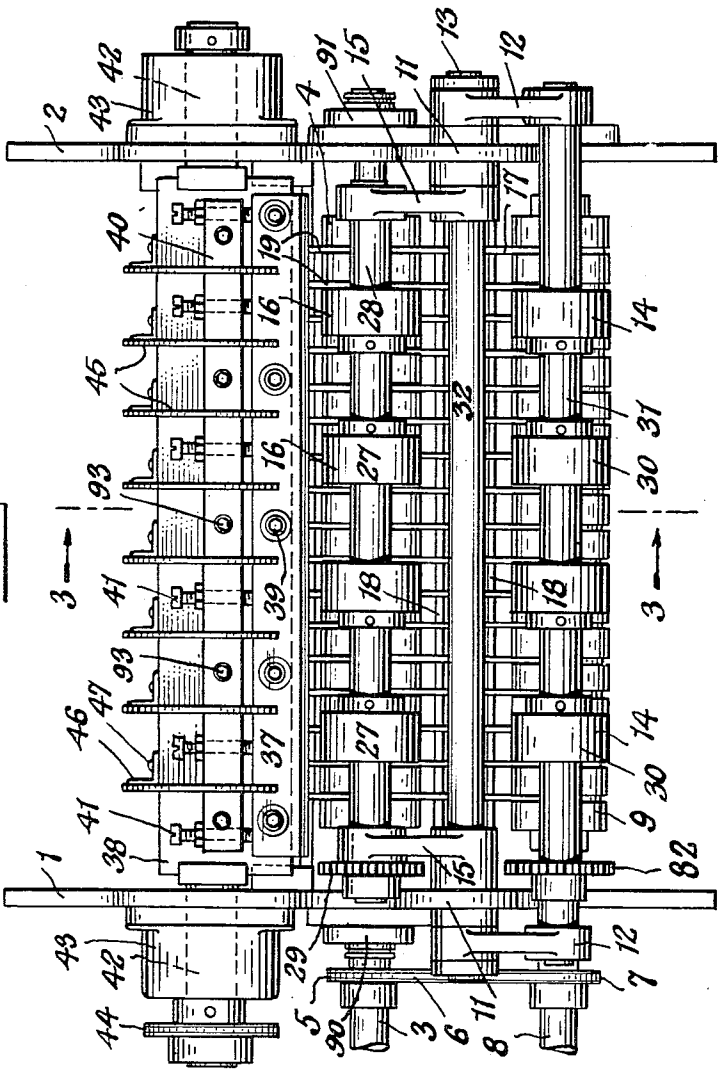
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4 Sheets-Sheet 2

Fig. 2.



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4 Sheets-Sheet 4

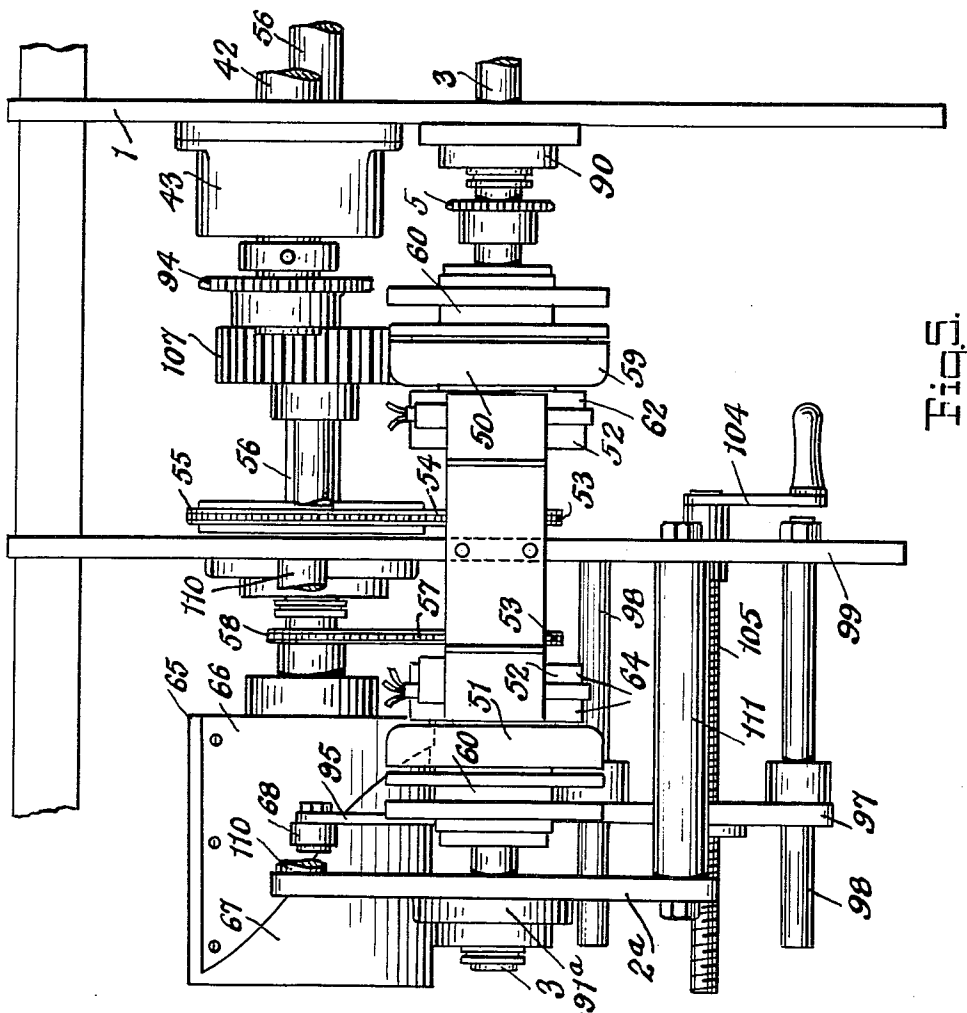


Fig. 5.

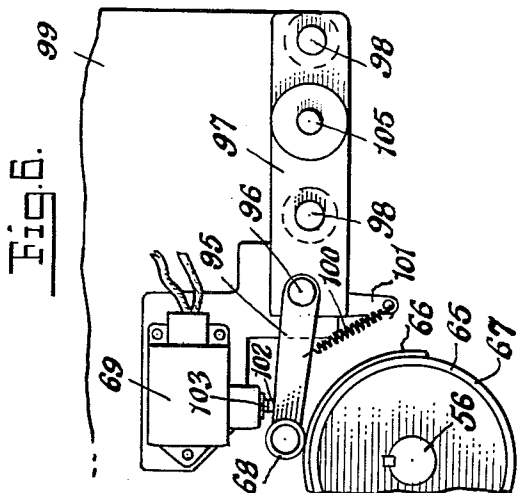


Fig. 6.

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SHEET MATERIAL FEEDING AND CUTTING APPARATUS

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10 Claims. (Cl. 164—68)

This invention relates to sheet-feeding and cutting apparatus, and more particularly to a mechanism of the character employed in machines for wrapping or enclosing boxes or other articles in sheet material.

In machines of the above-mentioned type, the sheet material which may be of any suitable nature and which is often composed of the transparent, cellulosic material known as cellophane, is fed from a roll and lengths of the proportions needed for boxes of a given size, are successively cut off and delivered to a point above or adjacent to the boxes or other articles about which the sheets are wrapped and sealed. It is obvious that when boxes of different size are fed into a machine of this character, the length of the severed sheets must be changed accordingly so that for each size of box, sheets of the proper size will be delivered to the wrapping station.

While provision has been heretofore made in wrapping machines for means by which the length of the sheets severed from the roll could be varied, the known arrangement of the apparatus to effect this result, required the substitution of gears, or else necessitated the change or extensive adjustment of other parts, thus calling for the attendance of a skilled mechanic and a preciseness of adjustment which was time-consuming and expensive to the owner of these machines.

It is therefore one of the objects of the present invention to provide means by which the cut sections or individual sheets severed from the web drawn from the supply roll can be varied in length by a minimum of effort and without the use of tools or the services of a mechanic.

It is a further object of the invention to provide a mechanism of this kind by means of which a precise regulation of the length of the severed sheets can be had so that boxes within a wide range of sizes can be supplied and neatly wrapped.

It is another object of the invention to provide an easily-adjusted means for cutting sheets of various lengths and which means, when adjusted by simple crank movement, will repeatedly cut the web of material into sections of uniform length.

With these and other objects to be hereinafter set forth in view, I have devised the arrangement of parts to be described and more particularly pointed out in the claims appended hereto.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed.

Fig. 1 is a front elevational view, with parts in section, of those parts of a sheet-feeding mechanism to which the present invention relates;

Fig. 2 is a top plan view of the feed rolls, the cutter and associated mechanism;

Fig. 3 is a sectional view on a slightly-enlarged scale, taken on the line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 shows the electrical wiring diagram for the control of the electro-magnetic clutches;

Fig. 5 is a top plan view, with certain parts fragmen-

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tarily shown, of the magnetic clutches, the cam mechanism for controlling the operation of the clutches, and associated parts, and

Fig. 6 is an end view, looking from the left of Fig. 5 of the cam control for the magnetic clutches.

Referring to the drawings, 1 and 2 indicate portions of the frame of the machine where the present improvements are situated. These frame elements 1 and 2 are disposed in spaced, parallel relation and suitably braced, several of the bracing rods therefor being shown at 10, 25 and 26. Rotatively mounted in suitable bearings 90 and 91 in the frame members 1, 2 and 2a is a shaft 3 which carries a lower feed roll 4. The frame member 2a is connected to the frame member 99 by the rods 110 and 111. A similar shaft 8 is also rotative in suitable bearings in the frame members, said shaft carrying the lower feed roll 9. Mounted above the lower feed roll 4 is an upper feed roll indicated at 16, the same being composed of a plurality of roll sections 27 (Fig. 2) pinned on the shaft 28, which is supported at its ends in the links 15. The upper feed roll 16 is driven by a gear 29 in mesh with a similar gear (not visible in Fig. 2) but located below the gear 29 and borne by lower feed roll shaft 3.

Located above the lower feed roll 9 is an upper feed roll 14, composed of the separated roll sections 30, pinned on the shaft 31, which shaft 31 has its ends supported in the links 12 hung from the cross rod 32 supported in the elevated portions 11 of the frame members 1 and 2. Upper feed roll shaft 31 carries a gear 82 in mesh with a gear not visible in Fig. 2, but borne by the shaft 8 of the lower feed roll 9.

The paper web which is to be cut into lengths of required size, is indicated at S in Fig. 3 and the same is drawn from a suitably-positioned supply roll not shown, and extends over guiding means also not shown, and is moved toward the left, as viewed in Fig. 3 by the feed rollers 4, 9, 14 and 16 which have been described. To prevent sagging of the web S as it moves between the feed rolls toward the cutter, spaced supporting blades 17 are provided between the feed rolls 4 and 9, these blades being mounted on rods 18 held at their ends in the frame elements 1 and 2. Somewhat similar web-supporting blades are employed at 19 and are located between the lower feed roll 4 and the stationary blade 33 of the cutter. The blades 19 are mounted in spaced relation upon rods 20 (Fig. 3) supported at their ends in the frame members 1 and 2.

The fixed cutting blade 33 is adjustably mounted by screws 34, on a cross bar 35 secured at its ends by the brackets 36 to the frame members 1 and 2. Rotatively mounted above the stationary blade 33 is the movable cutter. The same includes a cutting blade 37, adjustably secured to a cross bar 38 by the screws 39. A block 40 secured to the cross bar 38 by screws 93 threadably receives set screws 41 by means of which the cutting blade 37 may be adjusted relatively to the stationary cutter 33.

At its opposite ends, the bar 38 is provided with shaft portions 42, rotative in the bearings 43 secured to the frame members 1 and 2. The rotatable cutter is driven by a chain 44, extending over a sprocket 94 on one of the shaft portions 42 (Fig. 5), the chain 44 extending from a sprocket on one of the driven shafts of the machine of which the present apparatus forms a part. The rotatable cutter is continuously driven during the operation of feeding the sheet material by the feed rollers above described. Fins or disks 45 are secured to the bar 38 by angle brackets 46, which are fastened to the bar by the screws 47. These fins maintain the sheet material flatly and prevent it from wrapping around the rotary cutter.

In order to control and regulate the length of the sheets to be cut according to the size of boxes or other articles to be wrapped, the rate of feed of the sheet S by the feed rolls, must be varied according to sheet size requirements. The shaft 3, upon which the feed roll 4 is mounted is the speed-controlling element and it in turn controls the speed of the lower feed roll shaft 8 by driving the latter roll shaft by means of a chain 6 extending over sprockets 5 and 7 provided respectively on the shafts 3 and 8.

Mounted upon the shaft 3 of the feed roll 4 are two electro-magnetic clutches indicated respectively at 50 and 51. The clutch indicated at 50 is the high speed clutch for when it is energized and becomes engaged in a manner to rotate the shaft 3, the shaft will be rotated at a relatively high speed as for example, three times the speed at which the shaft is rotated when the low speed clutch 51 is in engaged position.

Each of the clutches 50 and 51 is of known construction and is commercially available, and includes a magnet hub 52 loose on the shaft 3 and a sprocket 53 is fixed to the hub, said sprocket being also loose on the shaft 3. The sprocket 53 carried by the hub 52 of the clutch 50, is driven by a chain 54 which extends around a sprocket 55 mounted upon a cam shaft 56 of the machine. Similarly, the sprocket 53 carried by the hub 52 of the low speed clutch 51 is driven by a chain 57 which extends around sprocket 58 also carried by the cam shaft 56. The sprocket 55 is relatively large so that it drives the clutch 50 at high speed and hence, as heretofore pointed out, when the clutch 50 is in its energized and engaged position, the shaft 3, carrying feed roll 4, will be driven at such high speed. On the other hand, when clutch 51 is energized and thus engaged, the shaft 3 will be driven at a relatively low speed. Accordingly the rate of feed of the sheet S will be governed by the respective periods of engagement of the two clutches.

The clutches 50 and 51 each include the armature assembly 59 having a hub 60 which is fixed to the shaft 3. The arrangement of the clutches is such that when one or the other of the magnets 52 is energized, it will magnetically attract its armature and the shaft 3 be thus rotated. The speed at which the shaft 3 will be rotated, will of course, be dependent upon which of the clutches is energized. Current is carried to the high speed clutch 50 through the brushes 61 in contact with the slip rings 62 on the magnet hub 52 and similarly the brushes 63 contact with the slip rings 64 on the magnet hub of the low speed clutch 51.

The periods of energization of the two clutches and hence the feeding speed of the web S is controlled by a cam shown at 65. This cam is carried on the cam shaft 56 and is provided with the high and low areas designated respectively at 66 and 67. A roller 68 rides on the cam, and said roller controls a micro-switch 69 in such a manner that while the roller is riding on the high area 66 of the cam, the switch 69 will maintain a closed electrical circuit to clutch 50 to energize the same and thus the shaft 3 and feed roll 4 carried thereby will then be rotated at a high rate of speed. On the other hand, while the roller 68 is riding on the low area 67 of the cam, the switch 69 will maintain closed circuit to the low speed clutch 51 and this clutch will be driving the shaft 3 at a low rate of speed. It will, of course, be understood that when one clutch is energized, the other will be de-energized.

As will be clearly seen in Fig. 6, the cam roller 68 is rotatively carried by a lever 95, pivoted at 96 on a bar 97 which is slidably adjustable upon rods 98 secured at one end in a frame element 99. The cam roller 68 is maintained in constant contact with the surface of the cam 65 by means of a coil spring 100 having one end attached to the cam lever 95 and its other end attached to the arm 101 formed on or extended from the bar 97. The cam lever carries a projection 102 which engages with the actuating button or control member 103 of the micro switch 69.

in a manner to cause the switch to close circuit to either of the clutches 50 and 51 as required and to maintain the circuit closed for the period of time that the cam roller is in contact with the raised or low portions of the cam 65.

The roller 68 is adjusted axially of the cam 65 by means of a crank 104 secured on the end of a threaded shaft 105 rotative in the frame element 99 and in threadable engagement with the bar 97. This arrangement is such that when the crank 104 is rotated the bar 97 will be slidably moved along the supporting rods 98 to thereby move the cam roller 68 axially of the cam, and because of the tapered shape of the high cam surface 66, determine the period of time with which the roller 68 will be in contact with such surface 66 and thereby govern the period during which the web S will be fed at high speed toward the cutter 37 during each rotation of the cutter. The parts may be calibrated to enable the cam roller to be repeatedly set at the same location to thereby constantly secure cut sheets of similar length.

The bracket carrying the micro switch 69 is carried by the bar 97 so that when the bar 97 is adjusted along the rods 98 it will move the roller 68 and switch elements 102 and 103 and 69 along with it.

The cam shaft 56 is provided at one end with a sprocket 70 (Fig. 1) which is driven by a chain 71 extending from a sprocket 72, loose on the main shaft 73 of the machine, and which main shaft is driven from a motor or other power source. Slidable on the end of the shaft 73 is a clutch dog 74 which is rotative with the shaft 73. A clutch-operating lever 75 is coupled at 106 to the clutch dog 74, which lever is pivoted at 76 to a fixed part of the machine, and has its opposite end pivotally connected at 77 to a link 78 which is connected to the core 79 of a solenoid 80. The solenoid 80 is energized by a micro-switch, not shown, but arranged along the path of travel of the boxes or other articles to be wrapped, and as long as boxes are travelling on the conveyor of the machine toward the wrapping station, the micro-switch will remain closed and the solenoid 80 will remain energized. While the solenoid remains energized, the clutch dog 74 will be engaged with the sprocket 72 and will drive the same to cause it to drive shaft 56 through the chain 71 and sprocket 70. The meshed gears 107 and 108 are elements not concerned with the present structure.

In Fig. 4 is disclosed the electrical diagram showing the manner in which the control of the speed of the feed roll 4 is had. As heretofore explained, the micro-switch 69 is operated by up and down movements of the cam roller 68 as it rides on the high and low areas of the cam 65. In Fig. 4 the roller 68 is shown riding upon the low area 67 of the cam and hence current is being conveyed by wires 76 and 77 to the slip rings 64 of the low speed clutch 51 and while the cam roller 68 travels over this low surface of the cam, the shaft 3 and feed roll 4 thereon will be driven at a low speed. When the cam roller 68 reaches and travels on the high surface 66 of the cam, the elevating movement of the switch-operating pin 102, will break circuit to the slip rings 64 and will complete circuit through wires 78 and 79 to the slip rings 62 to thereby energize clutch 50 and drive the high speed clutch and the shaft 3 then coupled thereto.

The current supply for the magnetic clutches 50 and 51 is obtained through the wires 80 and 81 extending from the conventional power supply line, said wires connecting to a rectifier 83 for the conversion of the AC current to direct current. Rheostat 84 controls the current flow to the clutches and the switch shown at 109 is the main switch for the control of the circuit.

It has been found desirable to provide means by which the clutch that is de-energized shall be kept under slight drag by permitting a small amount of current to flow through its magnetic coil. That is to say, while the clutch 50 for example, is energized and is driving the shaft 3 at high speed, a slight amount of current will at the same time be permitted to flow through the magnetic coil of

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the then-inoperative clutch 51. The reason for the desirability of such an arrangement is that it has been ascertained that it is possible to secure very quick energization of the clutch magnets and hence a quick shift from one clutch to the other when one clutch is maintained under slight magnetic drag while the other is fully energized. The drag thus maintained on the inoperative clutch is secured through the rheostat 85 and resistance 86 and the wiring connected thereto in the manner disclosed in the diagram of Fig. 5, and which functions to supply the light charge to the magnetic coil of either clutch while the other clutch is energized.

From the foregoing, the operation of the improved feeding and cutting apparatus will be readily understood. The web of sheet material indicated at S in Fig. 3, moves from right to left under the operation of the feed rolls 4, 9, 14 and 16. In normal operation the slow speed clutch 51 is energized and during the period of energization of that clutch, the feed roll 4 is rotated at its normal or slower speed. When the cam roller begins its ride on the high portion 66 of the cam 65, the switch-actuating pin 102 will be elevated to cause the micro-switch 69 to open circuit to switch 51 and close circuit to switch 50, so that the feed roll 4 will instantly accelerate to high speed and will operate at such high speed for the period of time, during each revolution of the cutter 37, that the cam roller 68 will ride on the high portion 66 of the cam 65. This period of time is governed by the position of the roller 68 relatively to the tapered high portion of the cam, and which position is regulatable by shifting of the cam roller axially of the cam by manipulation of the adjustment crank 104. It will be obvious therefore, that by rotation of the crank 104, the cam roller 68 can be positioned relatively to the cam 65 in a manner to control the period of time during which the low and high speed switches will be closed and thus control the length of the section of the web S that is fed to the cutter during each rotation of the cutter 37. It will be apparent therefore, that the matter of regulating the size sheets to be cut according to the size of the boxes is simple and precise and requires no mechanical changes to effect continuous cutting of the sheets of selected sizes. While one of the clutches is energized, there is maintained on the other slight magnetic drag as previously explained, thus causing instantaneous complete energization when the shift from one clutch to the other is required.

Having described a single embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. An apparatus for feeding sheet material for severance into lengths of selected sizes comprising, a feed roll and a pressure roll between which the sheet is moved to a cutting means, a shaft carrying the feed roll, said shaft carrying a plurality of electro-magnetic clutches driven at different rotative speeds, switch means by which one or the other of the clutches is energized to thereby rotate the shaft at either a slow or a faster rotative speed and to selectively cause rotation of the shaft at different speeds, and adjustable means by which the time of energization of either magnetic clutch can be regulated.

2. In an apparatus for feeding sheet material for severance into lengths of selected sizes, as provided for in claim 1, wherein the adjustable means consists of a rotatable cam, a switch-operating lever movable by the cam, and means by which said lever is adjustable relatively to the cam to thereby determine the period of time of energization of each magnetic clutch.

3. In an apparatus for feeding sheet material to cutting means for severance into sheets of selected sizes comprising, a feed roll and a co-operating pressure roll between which the sheet is moved to cutting means, a drive shaft for the feed roll, a pair of electro-magnetic clutches for driving said shaft, one of said clutches being driven at a relatively low speed and the other at a faster

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speed so that the rotative speed of the shaft is governed by the coupling of one or the other of the clutches to said shaft, switch means for controlling the selective energization of one or the other of the clutches, and means for determining the period of time for which either of the clutches is energized while the sheet is in feeding movement toward the cutting means to thereby vary the speed of feed of the sheet to the cutting means and accordingly determine the length of the cut sheet.

4. In an apparatus for feeding and cutting sheet material as disclosed; an improvement of the feeding means which includes, cutting means comprising a rotary cutter operated at a uniform rotative speed, rolls for feeding the sheet material to the cutter, one of said rolls consisting of a driven feed roll, a shaft for rotating said driven roll, a pair of magnetic clutches for selectively rotating said shaft at different rotative speeds, and cam means for regulating the periods of operation of each of the clutches and for causing variation in the speed of sheet fed between cuts by the cutting means.

5. An apparatus for feeding sheet material for severance into lengths of selected sizes comprising, a feed roll, a pressure roll co-operating therewith to cause feeding movement of the sheet toward a rotary cutter, a shaft upon which the feed roll is mounted, a pair of electro-magnetic clutches upon said shaft, switch means for controlling an electric circuit to the clutches and by the operation of which one or the other of the clutches is energized, one of the clutches being rotated at greater speed than the other, cam means for operating the switch to cause one or the other of the clutches to be energized for given periods of time between the cuts of the cutter to thereby vary the feeding speed of the sheets between cuts thereof, and means for adjusting the cam means to thereby increase or decrease the periods of energization of the clutches.

6. In an apparatus for feeding and severing sections from a web of sheet material as disclosed; an improvement in the feeding means which includes a rotary cutter, feed rolls for moving the web toward the cutter, means for controlling the speed of one of the feed rolls comprising a pair of electro-magnetic clutches on the shaft of said roll, a cam and means for rotating the same, a roller operative against the cam and caused to be raised and lowered by the cam, a switch controlled by the raising and lowering movements of the cam roller, said switch being in circuit with the clutches whereby one of the clutches will be energized when the roller is in its raised position and the other clutch will be energized when the roller is in its lower position, and means for regulating the position of the roller relative to the cam to thereby vary the periods during which the roller is maintained in its raised and lowered positions by the cam.

7. In an apparatus as provided for in claim 6, wherein the means for regulating the position of the roller consists in a threaded shaft, a support for the roller threadably engaging said shaft, guide means for the shaft to permit the shaft to be adjusted in a direction parallel to the axis of the cam, and a crank for so adjusting the shaft.

8. A speed-controlling means for the shaft of a sheet-feeding roller comprising a pair of electro-magnetic clutches on said shaft, each clutch including a sprocket free on the shaft and the sprockets being driven at different speeds, switch means for controlling the selective energization of the clutches, cam means for controlling the operation of the switch, and adjustable means by which said cam means will cause operation of the switch for given periods to thereby control the relative time of operation of the two clutches.

9. A speed-controlling means for the shaft of a sheet-feeding roller comprising, a pair of electro-magnetic clutches on said shaft, each clutch including a sprocket free on the shaft and the sprockets being driven at dif-

ferent speeds, switch means for controlling the operation of the clutches, means by which the period of time each clutch will be energized is controlled to thereby control the relative periods of operation of the two clutches; and means for imparting a partial energization on one clutch to exert a slight magnetic drag thereon while the other clutch is fully energized.

10. An apparatus for feeding sheet material for severance into lengths of selected sizes comprising, rolls between which the sheet is moved to cutting means, a plurality of electro-magnetic clutches operative to drive one of the rolls, said clutches being driven at different speeds and being operative to drive the roll at different speeds,

switch means by which one or the other of the clutches is energized to thereby rotate the roll at either a slow or a faster rotative speed and to selectively cause rotation of said shaft at the different speeds, and adjustable means by which the time of energization of either magnetic clutch can be regulated.

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