Jan. 10, 1967 A. F. SHIELDS 3,296,908

MULTIPLE CUT-OFF DEVICE FOR WEB MATERIAL

Filed May 25, 1965 4 Sheets-Sheet 1

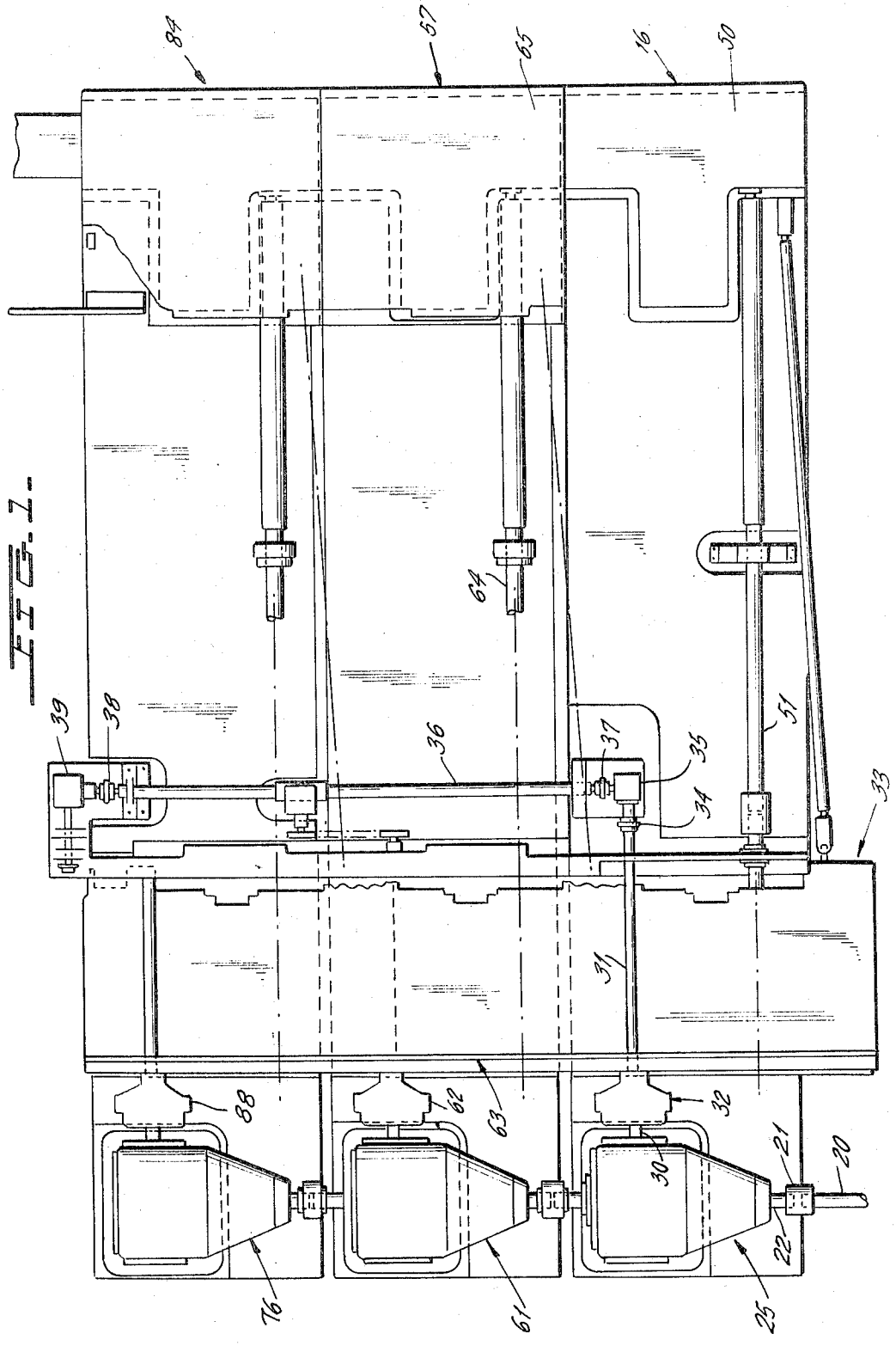


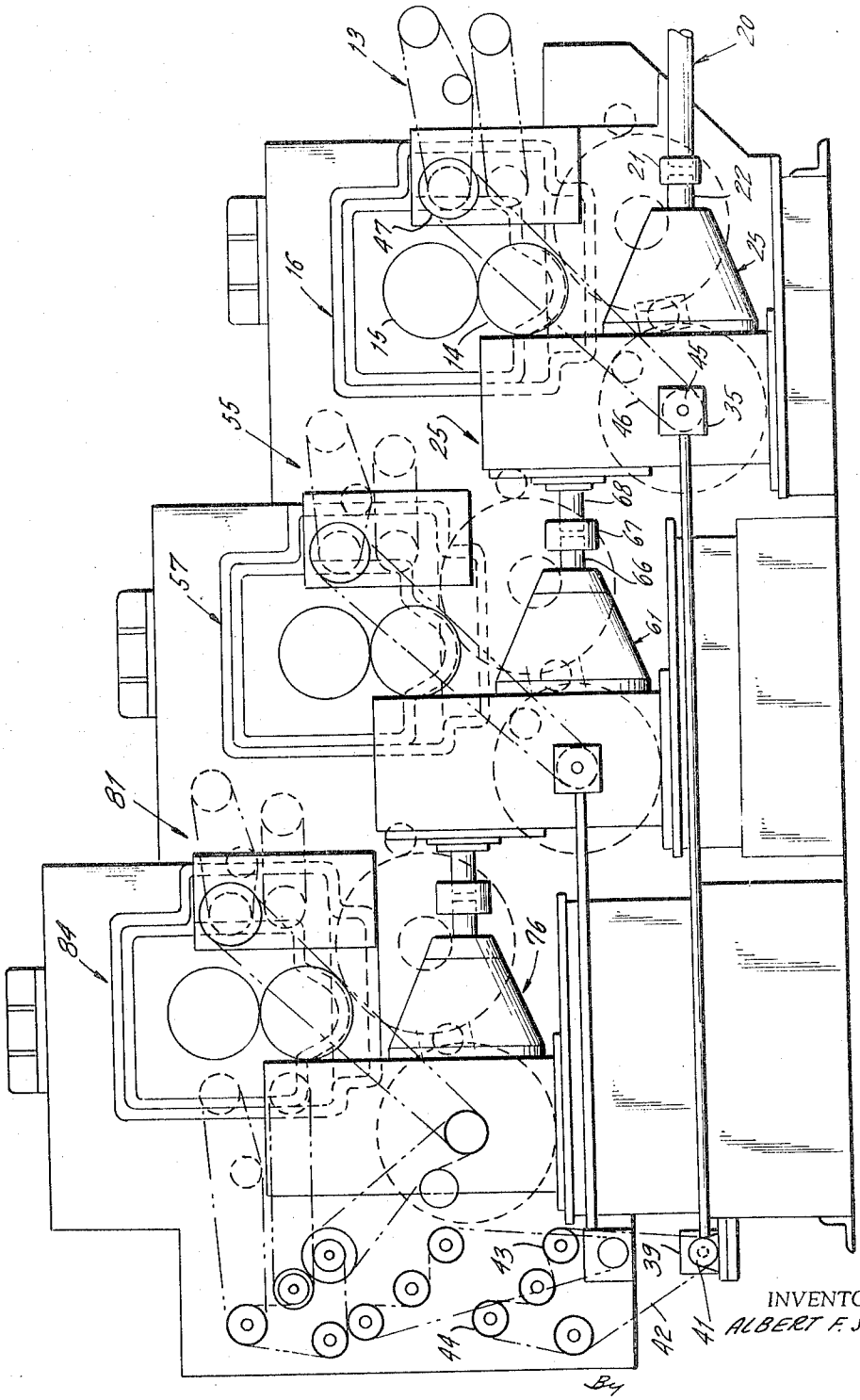
FIG. 1.

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MULTIPLE CUT-OFF DEVICE FOR WEB MATERIAL

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FIG. 2.



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MULTIPLE CUT-OFF DEVICE FOR WEB MATERIAL

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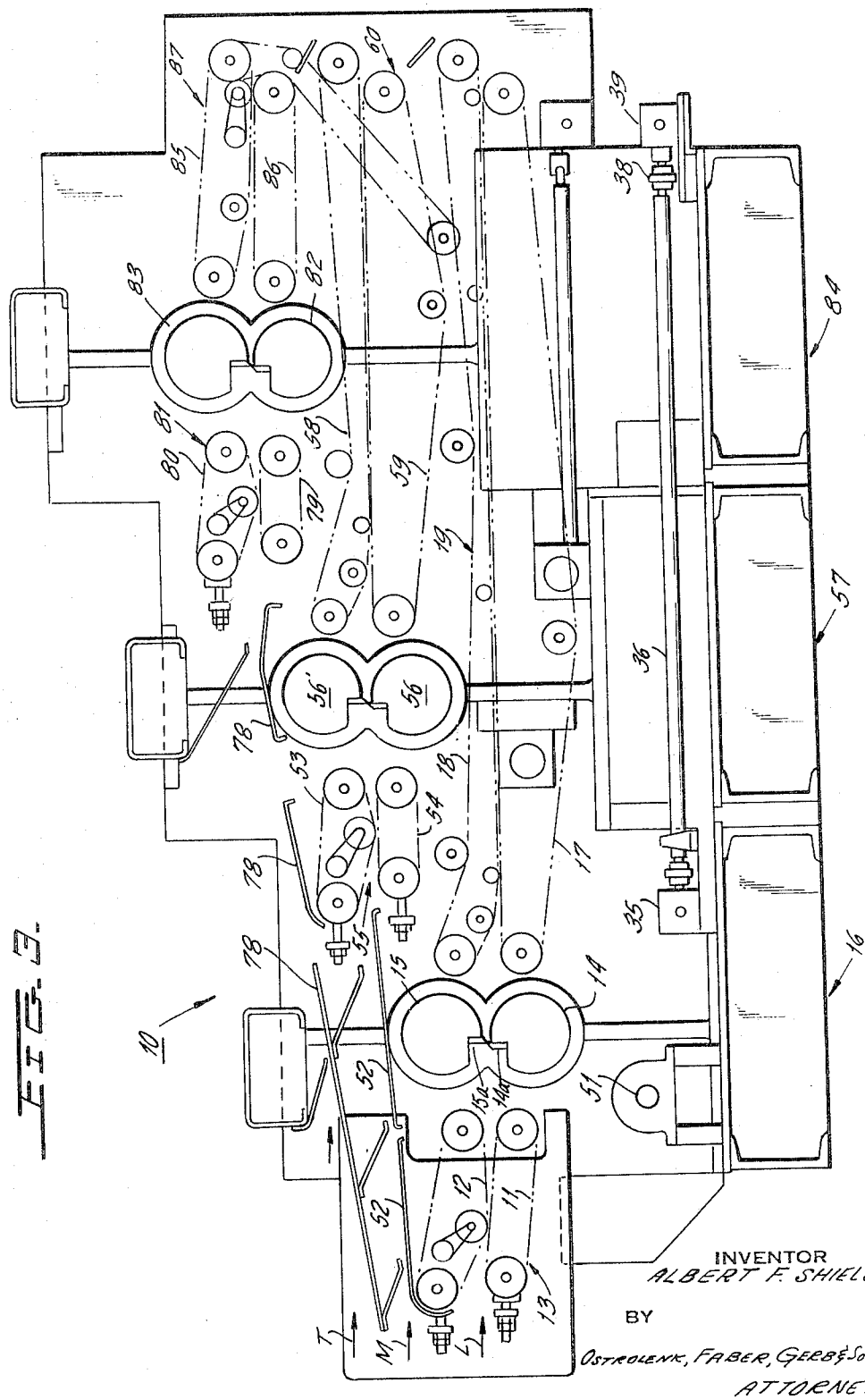


FIG. 3.

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MULTIPLE CUT-OFF DEVICE FOR WEB MATERIAL

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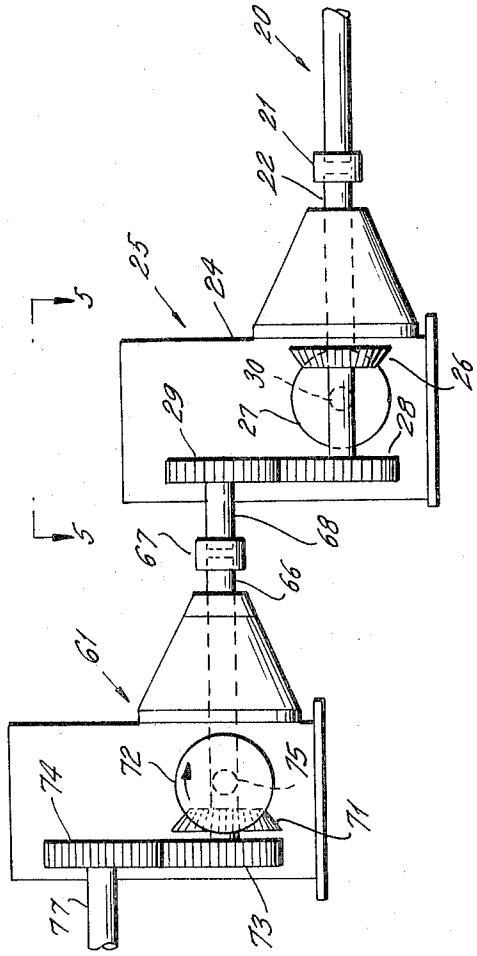


FIG. 4.

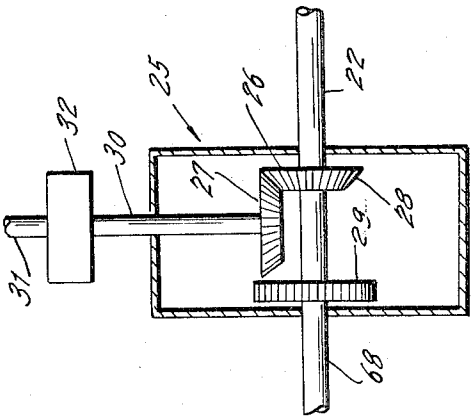


FIG. 5.

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3,296,908

MULTIPLE CUT-OFF DEVICE FOR WEB MATERIAL

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2 Claims. (Cl. 83—303)

This invention relates to devices for cutting continuously advancing webs of stiff material into sheets and in particular relates to a multiple cutoff unit for this purpose.

Double faced corrugated board produced by a so-called double backer is so stiff that it cannot be wound into roll form. Thus, the web issuing from the double backer is cut into sheets by a so-called cutoff typically comprising a pair of revolving knife carrying drums with the knives extending transverse to the axis of the web with a sheet being cut from the web for each revolution of the knife drums. By coordinating the speed of web movement to the speed of the knife drums, sheet length is controlled.

It often happens that relatively large size corrugated board cartons are made from a single sheet of corrugated board. Under these conditions the web must be relatively wide. If the double backer is of a size sufficient to produce this relatively wide board it is not economical to operate the double backer for production of narrow board. Under circumstances where two or more blanks may be accommodated across the width of the web, a slitter cuts the web along the longitudinal axis thereof into a plurality of strips which pass through separate cutoffs.

In the case of a conventional so-called double cutoff (two cutoffs operating in conjunction with a single double backer) the prior art for the most part utilized cutoffs of different constructions with complicated driving mechanisms which impaired the accuracy of cutting and required frequent maintenance. Often the input driving power to one cutoff was on one side of the double cutoff while input driving power to the other cutoff was on the other side of the double cutoff. In many cases this arrangement, although costly, operated reasonably well. However, for an installation where conditions were crowded on one side of the double cutoff servicing was a problem and there was excessive use of chain drive means connecting the cutoffs to the common source driving the cutoffs and double backer. Further, in the prior art the feed and delivery belts for each of the cutoffs operated continuously even though web material was not being fed to one of the cutoffs.

In more recent years the width of double backers has increased to a point where it is not unusual to produce a web which is wide enough to accommodate three sheets. Under these conditions the slitter divides the web into three ribbons each of which is fed to a different cutoff if the sheet lengths measured parallel to the web axis are different. This arrangement of three cutoffs is known as a "triple cutoff."

In constructing a triple cutoff one of the major problems to be overcome is to prevent interference between power transmission elements of the cutoffs and conveyors with the web material. The device of the instant invention overcomes this problem by utilizing an economical construction in which each of the cutoffs is of substantially identical construction with the drive elements of all three cutoffs being positioned on the same side of the triple cutoff. By placing all of the cutoff and conveyor drive mechanisms on one side of the triple cutoff gearing is minimized and it is not necessary to utilize chains for power transmission to the cutoffs, even though it is necessary to have the knife drums of the different cutoffs at different heights so that the web material may pass over one or more cutoffs, as the case may be, when such cutoffs are not required to cut the web in question. Further, by

maintaining all of the cutoff drive elements on one side of the triple cutoff procedures to prevent interference between driving members, the web, and/or the conveyors is materially simplified. Separate clutches are provided to deactivate the conveyors when its associated cutoff is deactivated. This situation arises under conditions when only one or two cutoffs are required or when it becomes necessary to service one of the cutoffs. By deactivating the unneeded conveyors and cutoffs less wear takes place and operation is safer.

Accordingly, a primary object of the instant invention is to provide a novel construction for a multiple cutoff utilized for transforming a web into sheets.

Another object is to provide a novel multiple cutoff having at least three cutoff units each of substantially identical construction.

Still another object is to provide a novel multiple cutoff having the drive elements for all of the cutoff units are located on the same side of the cutoff.

Still another object is to provide a novel multiple cutoff which is of simplified construction and relatively economical to produce.

A further object is to provide a novel multiple cutoff which includes means for deactivating the conveyors associated with a particular cutoff when such cutoff is deactivated.

A still further object is to provide a novel multiple cutoff operated from a common drive source and requiring a minimal amount of gearing.

These as well as other objects of this invention will become readily apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 is a plan view of a triple cutoff constructed in accordance with the teachings of the instant invention.

FIGURE 2 is a side elevation of the triple cutoff of FIGURE 1 looking toward the drive side.

FIGURE 3 is a side elevation of the triple cutoff of FIGURE 1 looking toward the other side.

FIGURE 4 is a side elevation showing in schematic form the constructions and interconnection between the geared transmissions of adjacent cutoffs.

FIGURE 5 is a plan view in schematic form showing the connection between the power input shaft to a cutoff transmission and the connection of this transmission to the clutch mechanism.

In the following description of the figures reference will be made to a double backer, a cutoff and other apparatus used for producing a web of corrugated board, cutting the web in to strips, and cutting these strips into sheets. For details of such apparatus reference is made to the A. F. Shields U.S. Patent No. 3,176,652, issued April 6, 1965, and the W. G. Goettsch U.S. Patent No. 2,309,728, issued February 2, 1943, as well as other patents referred to in the aforesaid Shields and Goettsch patents.

Now referring to the figures. Triple cutoff apparatus, referred to generally by reference numeral **10**, receives strips of corrugated board L, M, T which are cut from a single web (not shown) by a slitter in a manner well known to the art, as the web is produced by a double backer. The lowest strip L is sandwiched between the belts **11**, **12** of conveyor **13** which moves strip L between knife drums **14**, **15** of lower cutoff **16**. As drums **14**, **15** revolve, the transversely extending knife blades **14***a*, **15***a* carried by drums **14**, **15**, respectively, sever strip L into sheets which move between the endless belts **17**, **18** of the lower output conveyor indicated generally by the reference numeral **19**. Drive power for lower cutoff **16**, lower input conveyor **13** and lower output conveyor **19** is obtained from main drive shaft **20** which is common to the drive system for the double backer (not shown) and slitter (not shown).

Drive shaft **20** is connected through coupling **21** to input shaft **22** of lower transmission **25** (see FIGURES 4 and 5), shafts **20** and **22** being in axial alignment. Disposed within transmission housing **24** are beveled gear **26** and spur gear **28** keyed to input shaft **22**. Beveled gear **26** is in engagement with beveled gear **27** keyed to lower output shaft **30** positioned at right angles to input shaft **22** and extending through the side of housing **24** to drive Reeves input shaft **31** through disengageable clutch **32**. In a manner well known to the art and as best seen in FIGURE 1, transverse shaft **51** extends from the output of Reeves drive **33**, across apparatus **10** to the input of the linkage mechanism **50** for driving the knife drums **14, 15** of lower cutoff **16** in timed relationship with respect to lower input conveyor **13** so that the sheets produced by lower cutoff **16** are of predetermined length. Shaft **31** extends through the Reeves housing and is connected by coupling **34** to gear box **35**. One end of longitudinally extending shaft **36** is connected by coupling **37** to gear box **35** while the other end is connected by coupling **38** to gear box **39** (see FIGURE 3). Sprocket **41**, driven by the output shaft of gear box **39**, drives chain **42** which supplies the driving power for lower output conveyor **19** by driving sprockets **43, 44**. Sprocket **45** (FIGURE 2) mounted to the input shaft of gear box drives chain **46** which in turn drives sprocket **47** and thereby supplies power to lower input conveyor **13**.

Similarly, the middle strip M (FIGURE 3) is guided by plates **52** over knife drums **14, 15** to a position between continuous belts **53, 54** of middle input conveyor **55***a*. Conveyor **55***a* feeds middle strip M between knife drums **56, 56'** of middle knife **57** which cuts strip M into sheets which are conveyed between the continuous belts **58, 59** of middle output conveyor **60**. Transmission **61** acting through clutch **62** and suitable sprocket and chain connections drives middle input and output conveyors **55***a* and **60**. Since these sprockets and chains are illustrated in the drawings and are similar to the sprocket chain connections described in connection with transmission **25**, lower input conveyor **13**, and lower output conveyor **19** no further description will be given herein. In addition transmission **61** acting through clutch **62** provides the input for Reeves drive **63** whose output is transmitted by shaft **64** to the driving linkages **65** for knife drums **55, 56** of middle cutoff **57**.

Now referring back to FIGURES 4 and 5. Input shaft **66** of transmission **61** is connected by coupling **67** to the auxiliary output shaft **68** of transmission **25**. Spur gear **29** is keyed to auxiliary output shaft **68** with the teeth of gear **29** in mesh with the teeth of spur gear **28** keyed to the input shaft **22** of transmission **25**. Spur gears **28, 29** are in a one to one ratio so that input shafts **22** and **66** rotate at the same speed. Transmission **61** also includes beveled gear **71** and spur gear **73** keyed to input shaft **66**. Beveled gear **71** drives beveled gear **72** keyed to output shaft **75** of transmission **61** with output shaft **75** providing the input for clutch **62**. Transmission **76** is of a construction similar to transmission **61** and is provided with driving power transmitted from spur gear **73** in mesh with spur gear **74** keyed to the auxiliary output shaft **77** of transmission **61**.

Since transmissions **22, 61** and **76** are in a stepped arrangement with input power being applyed to the lowest transmission **25** and being fed therethrough as well as through transmission **61** to the highest transmission **76**, transmission **76** does not require spur gears or an auxiliary output shaft. It is noted that beveled gears **26** and **71** are facing in opposite directions so that even though input shafts **22** and **66** rotate in opposite directions output shafts **30** and **75** will rotate in the same direction. Further, all mating bevel gears are in a one to one ratio.

Top strip T is guided by plates **78** over lower cutoff **16** and middle cutoff **57** between the belts **79, 80** of upper input conveyor **81**. The latter drives strip T between knife drums **82, 83** of upper knife **84** which severs strip T into sheets fed between the belts **85, 86** of upper output conveyor **87**. In a manner similar to that previously described for the other cutoffs, conveyors, transmissions and clutches, the output of transmission **76** is applied through disengageable clutch **88** to drive upper cutoff **84**, upper input conveyor **81** and upper output conveyor **87** so that additional description would only be essentially redundant.

It is noted that all of the strips L, M, T travel at the same speed and travel generally parallel to the longitudinal axis of apparatus **10**.

Thus, it is seen that in the triple cutoff apparatus of the instant invention the transmissions for all three cutoffs **16, 57, 84** are positioned on the same side of the longitudinal axis of apparatus **10**. This arrangement is such that all three cutoffs **16, 57, 84** are of substantially identical construction, the principal differences being in the side frame supports which must be provided with different bearing apertures to support the conveyor shafts which are different in all three cases. Further, the transmission arrangement is such that chain drives between transmissions have been eliminated and many identical gear elements are used in all transmissions. Thus, it is seen that the construction of the instant invention results in a relatively economical structure since the number of different parts required is essentially minimized and there results a more accurate and reliable cutoff. Further, the construction is highly desirable from a user's viewpoint in that with all of the drive elements on the same side of the apparatus space is conserved and servicing is more convenient. Further, clutches are so placed that when a particular cutoff is not needed it can be deactivated together with its associated input and output conveyors.

Although there has been described a preferred embodiment of this novel invention, many variations and modifications will now be apparent to those skilled in the art. Therefore, this invention is to be limited, not by the specific disclosure herein, but only by the appending claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. Apparatus for receiving a web of material slit into a plurality of longitudinal strips all moving through the apparatus in the same general direction of travel at the same speed and cutting said strips transverse to the direction of travel to form sheets with the sheets cut from a first of said strips being of a different dimension measured along said path than the corresponding dimension of sheets cut from a second of said strips; said apparatus including a first cutoff, and a second cutoff; first means conveying said first strip into said first cutoff and second means conveying said second strip over said first cutoff into said second cutoff; a main drive shaft through which driving power is supplied to said apparatus; a first transmission means and a first disengageable clutch means connected to transmit power from said shaft to said first cutoff and said first means; a second transmission means and a second disengageable clutch means connected to transmit power from said shaft to said second cutoff and said second means; said first and said second transmission means and said first and said second clutch means all positioned on one side of said apparatus; said first and said second transmission means including a first and a second input shaft, respectively, as well as a first and a second output shaft, respectively; said first input shaft connected to said main drive shaft; said second input shaft connected through said first transmission means to said main drive shaft; each of said output shafts extending generally at right angles to said input shafts; said first and said second output shafts connected to said first and said second cutoffs, respectively, by said first and said second clutch means, respectively; said first transmission means also including an auxiliary output shaft axially aligned with and connected to said second input shaft; said first transmission means further including bevel gear

means transmitting driving power from said first input shaft to said first output shaft and spur gear means transmitting driving power from said first input shaft to said auxiliary output shaft.

2. Apparatus for receiving a web of material slit into a plurality of longitudinal strips all moving through the apparatus in the same general direction of travel at the same speed and cutting said strips transverse to the direction of travel to form sheets with the sheets cut from any of a first, a second, and a third of said strips having a different dimension measured along said path than the remainder of said first, second, and third strips; said apparatus including a first cutoff, a second cutoff and a third cutoff; first means conveying said first strip into said first cutoff, second means conveying said second strip over said first cutoff into said second cutoff and third means conveying said third strip over said first and said second cutoffs into said third cutoff; a main drive shaft through which driving power is supplied to said apparatus; a first transmission means and a first disengageable clutch means connected to transmit power from said shaft to said first cutoff and said first means; a second transmission means and a second disengageable clutch means connected to transmit power from said shaft to said second cutoff and said second means; a third transmission means and a third disengageable clutch means connected to transmit power from said shaft to said third cutoff and said third means; said first, said second and said third transmission means and said first, said second and said third clutch means all positioned on one side of said apparatus; said first, said second and said third transmission means including a first, a second and a third input shaft, respectively, as well as a first, a second and a third output shaft, respectively; said first input shaft connected to said main drive shaft; said second input shaft connected through said first transmission means to said main drive shaft; said third input shaft connected through said first and said second transmission means to said main drive shaft; each of said output shafts extending generally at right angles to said input shafts; said first, said second and said third output shafts connected to said first, said second, and said third cutoffs, respectively, by said first, said second and said third clutch means, respectively; said first transmission means also including a first auxiliary output shaft axially aligned with and connected to said second input shaft; said second transmission means also including a second auxiliary output shaft axially aligned with and connected to said third input shaft; said first transmission means further including first bevel gear means transmitting driving power from said first input shaft to said first output shaft and first spur gear means transmitting driving power from said first input shaft to said first auxiliary output shaft; said second transmission means including second bevel gear means transmitting driving power from said second input shaft to said second output shaft and second spur gear means transmitting driving power from said second input shaft to said second auxiliary output shaft.

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