United States Patent

Hilgemann

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[54] **APPARATUS FOR COILING MOVING WEBS OF PAPER, PLASTICS FILM OR OTHER SHEET MATERIALS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**.....**B65h 19/20,** B65h 35/02

[58] **Field of Search**.....242/56 R, 56 A, 64

[56] **References Cited**

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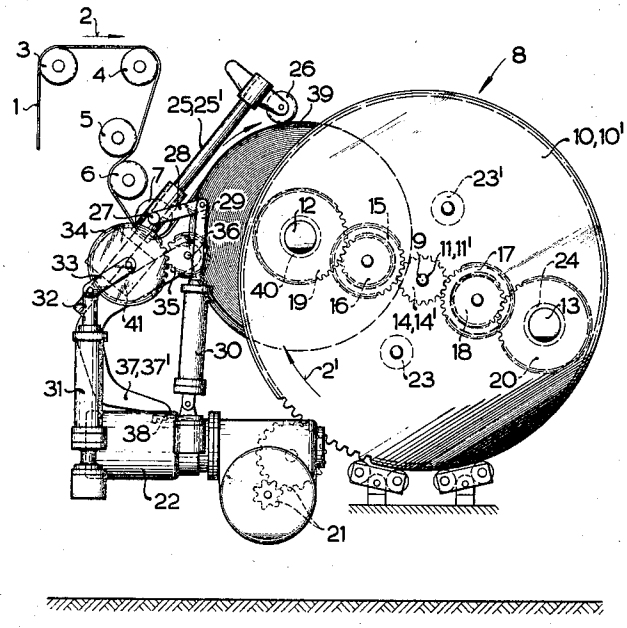
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[57] **ABSTRACT**

Apparatus for coiling moving webs of material wherein at least two winding mandrels alternately movable from a coiling station are provided and wherein a knife for severing the web between a completed coil moved out of the coiling station and an empty mandrel moved to the coiling station is positioned to be withdrawable after such severing. A pressure roll is also provided for pressing the severed leading end of the web against the empty mandrel, the pressure roll being withdrawable during the movement of mandrels to and from the coiling station and wherein the knife and pressure roll are independently operable so that, after withdrawal of the knife, the pressure roll remains applied to the web being wound at the coiling station.

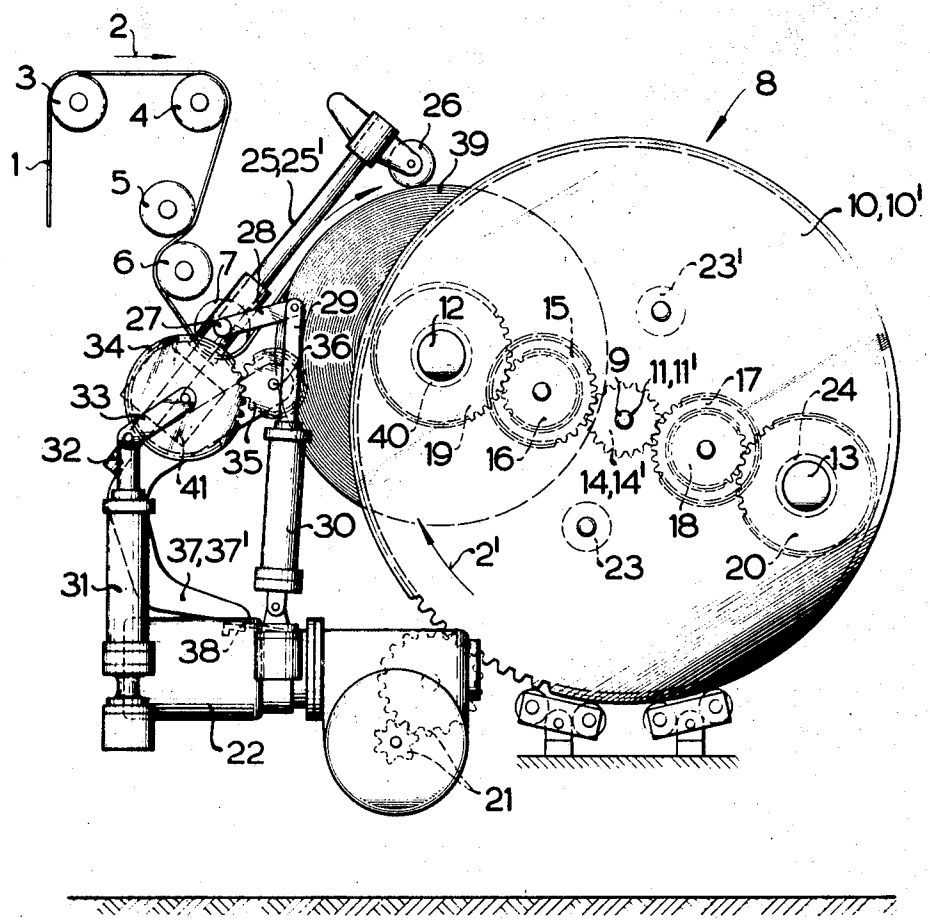
4 Claims, 3 Drawing Figures



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3 Sheets-Sheet 1

FIG.1

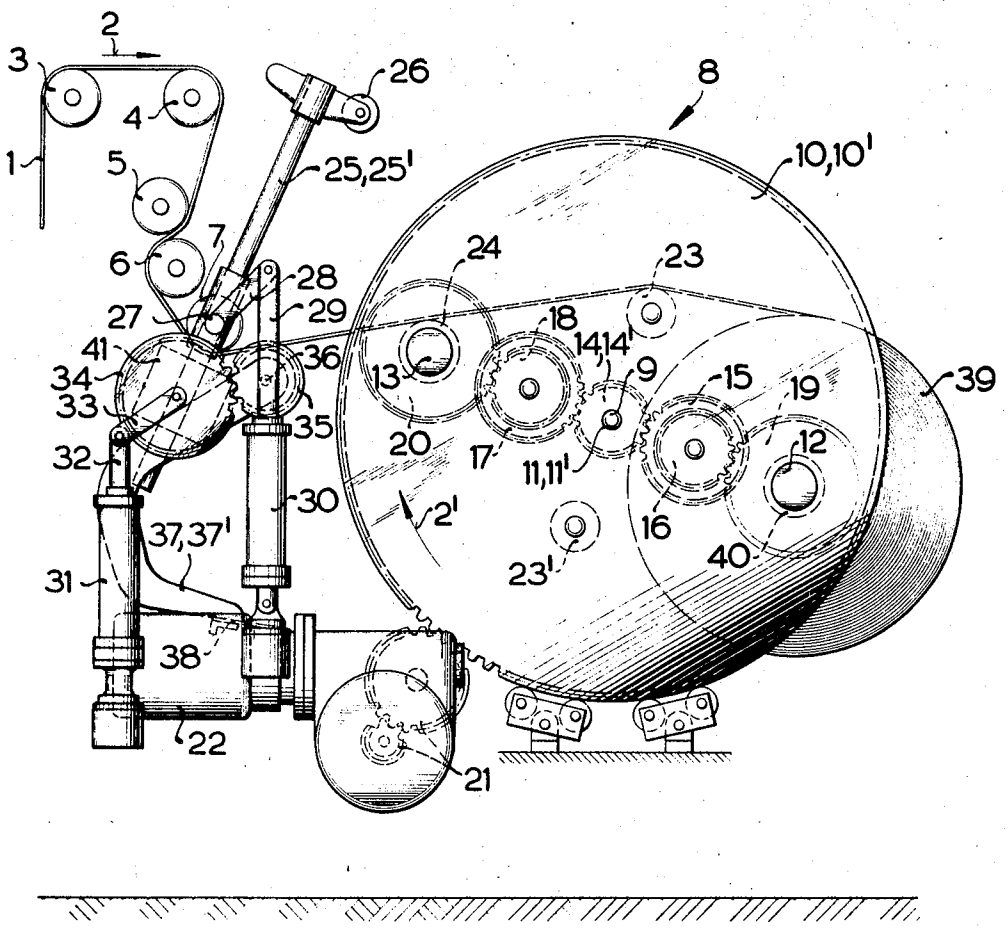


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FIG. 2

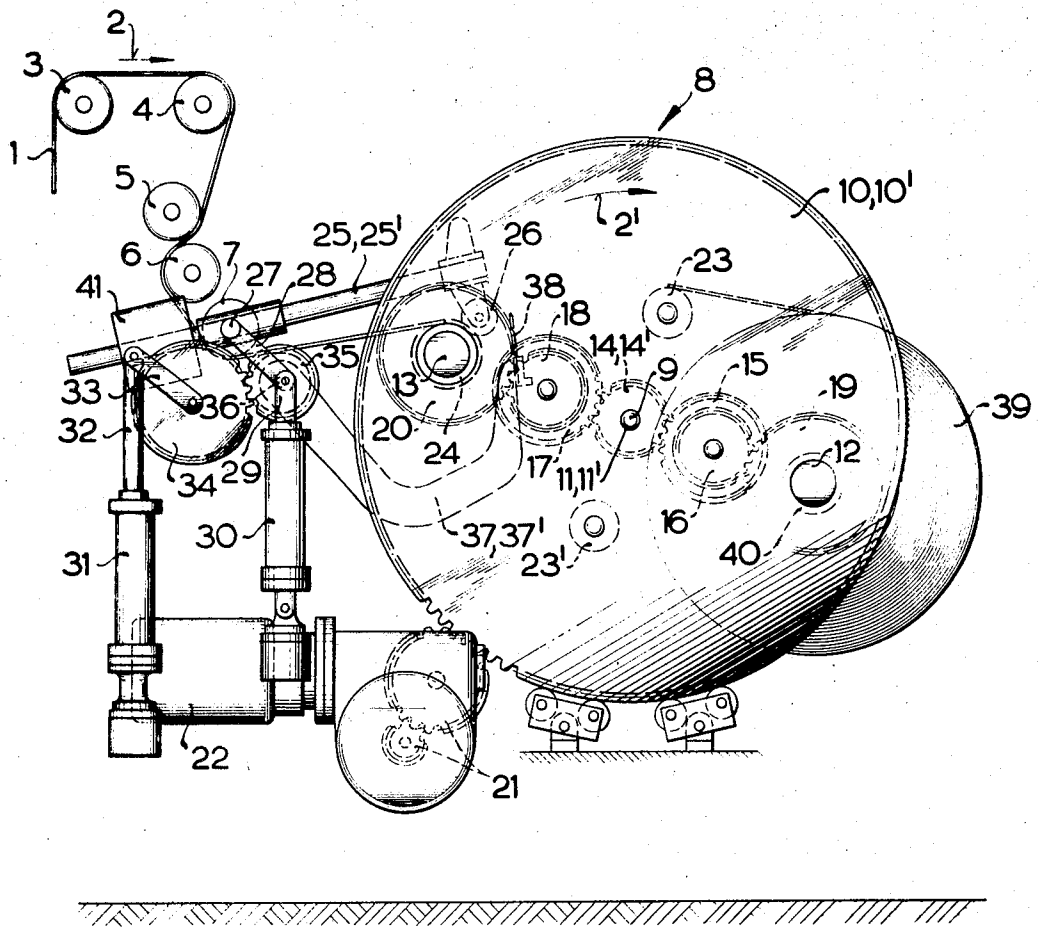


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FIG.3



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APPARATUS FOR COILING MOVING WEBS OF PAPER, PLASTICS FILM OR OTHER SHEET MATERIALS

The invention relates to an apparatus for coiling moving webs of paper, plastics film or other sheet materials, in which the web coming from a web-manufacturing or processing machine is wound on driven winding mandrels to form coils.

Known coiling apparatus of this kind for paper webs is equipped with two coiling stations. One such known apparatus comprises two mandrels mounted at the ends of two-armed levers. The levers are pivotable about a central axis so that the mandrels can be selectively brought to an operative position at the coiling station. When the maximum coil diameter has been reached at the coiling station, the completed coil is removed and an empty mandrel is brought to the coiling station without stopping the movement of the web. For this purpose a cardboard sleeve that has been precoated with adhesive and placed over the empty mandrel is accelerated to a speed equivalent to the speed of the web whilst the mandrel with the completed coil is at the same time swung away from the coiling station. The moving web is then pressed against the cardboard sleeve by means of a handwheel acting on a pressure roll that is suspended from levers. Simultaneously, the web is severed by a lever-mounted knife which is operated through gearing together with the pressure roll. For a short period, the leading end of the severed web is continued to be pressed by the pressure roll against the cardboard sleeve on which the web is now coiled until it reaches a maximum coil diameter. After the mandrels have been changed, the pressure roll and the knife are withdrawn by means of the handwheel. In order to produce a good coil without the inclusion of air pockets which might cause the coil to become distorted axially under telescopic movement of some of the web convolutions, a weighting roller is placed on the coil after the pressure roller has been withdrawn. This weighting roller lies on the coil with an adjustable pressure to facilitate efficient coiling. After a completed coil that is not at the coiling station has been lifted out of the two-armed levers, an empty mandrel with an adhesive-coated cardboard sleeve is introduced. When the coil at the coiling station has reached its maximum diameter, the weighting roller is swung away and the mandrels are changed in the above-described manner.

The known apparatus has the disadvantage that in the interval between lifting off the pressure roll and applying the weighting roller there is a danger of including air between the individual web convolutions. This is of particular disadvantage because it is just in the first few layers of the coil that air pockets give rise to telescopic coil distortions, especially in the case of webs of plastics film. Also, errors may arise during manual operation; for example the speeds and forces for actuating the severing knife and pressure roll may not be sufficient to effect proper parting of the web and adhesion of the severed leading web end to the cardboard sleeve. Such errors require the coiling apparatus to be stopped and this can prove very costly if it is borne in mind that this might also involve stopping the preceding machinery from which the web is supplied.

FIG. 1 illustrates a side view of the apparatus of this invention in one position of operation;

FIG. 2 is a side elevation of the apparatus of this invention in a second position of operation; and

FIG. 3 is a side elevation view of the invention in still another stage of operation.

According to the invention, apparatus for coiling moving webs of material comprises at least two winding mandrels which are alternately movable to and from a coiling station, a knife for severing the web between a completed coil moved out of the coiling station and an empty mandrel moved to the coiling station, the knife being withdrawable after such severing, and a pressure roll for pressing the severed leading end of the web against said empty mandrel, the pressure roll being withdrawable during movement of the mandrels to and from the coiling station, wherein the knife and pressure roll are independently operable so that, after withdrawal of the knife, the pressure roll remains applied to the web being wound at the coiling station. Thus, by means of the invention it can be ensured that the coil will not be left without a weight even during very short periods. Air pockets can therefore be avoided.

Means effective to exert pressure on the pressure roll whilst the leading web end is being pressed against the empty mandrel may be made ineffective so that the pressure roll is thereafter applied to the coil at a lower pressure until the coil has been completed. In other words, the pressure roll may in this form of the invention be used as a weighting roller so that a separate weighting roller is dispensed with. After termination of the pressure exerting means, the pressure roll may lie on the coil under gravity and its effective weight may be adjustable by a displaceable counterweight on a pivoted lever carrying the pressure roll. It is particularly advantageous for the knife and pressure roller to be operated by respective pneumatic cylinders which are mutually programme controlled so that the pressure roll is first moved to apply the moving web to an adhesive-coated tubular core on or forming part of the empty mandrel and immediately thereafter the knife is moved at a greater speed to sever the web and is thereupon withdrawn, whereafter the pneumatic cylinder operating the pressure roll is relieved so that the pressure roll will then lie on the coil only under gravity. The use of separate pneumatic cylinders enables independent actuation of the pressure roll and severing knife. For example, the pressure roll may be brought to an operative position at a medium speed which would be too slow for the knife to sever the web and the knife can be moved, almost simultaneously but with a much shorter time delay, at a higher speed to sever the web. The positive mutual programme control of the operating sequences of the two pneumatic cylinders permit the pressure roll and severing knife to be moved at accurately predetermined speeds and at exactly regulated forces and at accurate time intervals so as to avoid operating errors that might detrimentally affect efficient operation.

An example of the invention will now be described with reference to the accompanying drawings in which each of FIGS. 1 to 3 shows different operative positions of a coiling apparatus that is illustrated in diagrammatic side elevation.

A web 1 (FIG. 1) to be coiled arrives in the direction of the arrow 2 from a processing machine such as a

printing press and is led to the coiling apparatus **8** over guide rolls **3, 4, 5, 6** and **7**. The coiling apparatus comprises two pivotable discs **10, 10'** on a central shaft **9** having trunnions **11, 11'** mounted in a side frame (not shown). The discs **10, 10'** carry two diametrally opposite winding mandrels **12** and **13** each of which is driven by a separate motor (not shown). Each of these motors is mounted at a different side of the frame and the shaft of each motor is passed through one of the trunnions **11, 11'** of the corresponding disc **10** or **10'**, respectively. The inwardly protruding ends of the motor shafts carry respective pinions **14, 14'** driving gears **15, 16** and **17, 18**, respectively, which are carried by the respective discs and which, in turn, drive a gear **19** or **20** of the associated winding mandrel **12** or **13**.

The mandrel **12** is located at a coiling station in the FIG. **1** illustration. When the coil **39** thereon has grown to a predetermined diameter then, for the purpose of changing the mandrels, the discs **10, 10'** are swung through about 180° to the position shown in FIG. **2** by means of a worm gear motor **22** acting through gearing **21** in mesh with gear teeth at the peripheries of the discs. In the FIG. **2** position the web **1** still runs onto the coil **39** guided by one of two guide rolls **23, 23'** mounted between the two discs **10, 10'**. The guide rolls permit the web to pass close to a cardboard sleeve **24** that had been precoated with adhesive and placed on the empty mandrel **13**. Whilst the discs were being swung through 180°, the mandrel **13** and sleeve **24** were accelerated by the associated motor to reach a speed equivalent to the speed of the web.

A pressure roll **26** is provided which is rotatably mounted between two pivotable levers **25, 25'** the ends of these levers are fixed to a pivot shaft **27** which also carries a further lever **28** of which the free end is hinged to the piston rod **29** of a pneumatic cylinder **30** carried by the frame of the apparatus.

A further frame-mounted pneumatic cylinder **31** has a piston rod **32** for actuating a lever **33** which is hinged thereto and to the frame of the apparatus. At the pivotal axis of the lever **33** and fixed thereto so as to move therewith there is a gear **34** which engages a gear **35** fixed to a shaft **36** mounted in the frame of the apparatus. Two pivotal levers **37, 37'** rotate together with the shaft **36** and carry a transverse severing knife **38** between each other.

As soon as the discs **10, 10'** have been swung through 180°, the pressure roll **26** (FIG. **3**) is positively swung at a medium speed towards the web by means of the pneumatic cylinder **30** and presses the web at an appropriate pressure to the precoated cardboard sleeve **24**. Almost simultaneously but slightly later, the web **1** is severed upstream of the pressure roll **26** by means of the knife **38** which is moved by the cylinder **31** at a higher speed. The speed with which the pressure roll **26** is applied to the web and, with it, against the cardboard sleeve and the actual pressure of application can be adjusted via control valves (not shown). Similarly, the speed of movement of the knife **38** can be adjusted by a control valve, especially the speed with which it is moved towards the web. Similar adjustment also effects coordination of the movements of the knife and pressure roll which may be driven automatically from a common drive or actuated by hand.

After the web **1** has been severed, the completed coil **39** (FIG. **3**) is withdrawn from the mandrel **12** and replaced by a cardboard sleeve **40** which has been precoated with adhesive. After the first few web convolutions have been wound on the sleeve **24**, the knife **38** is withdrawn and the cylinder **30** is relieved so that the pressure roll will now lie on the coil under gravity, the weight being adjustable by a displaceable counterweight **41** to suit the nature of the web material being coiled. The pressure roll **26** is removed from the coil only after the latter is full and the mandrels are to be changed.

We claim:

1. Apparatus for coiling moving webs of material, comprising at least two winding mandrels which are alternately movable to and from a coiling station, a knife for severing the web between a completed coil moved out of the coiling station and an empty mandrel moved to the coiling station, the knife being withdrawable after such severing, and a pressure roll for pressing the severed leading end of the web against said empty mandrel, the pressure roll being withdrawable during movement of the mandrels to and from the coiling station, wherein the knife and pressure roll are independently operable so that, after withdrawal of the knife, the pressure roll remains applied to the web being wound at the coiling station.

2. Apparatus according to claim **1** including means effective to exert pressure on the pressure roll whilst the said leading web end is being pressed against the empty mandrel and for terminating the pressure so that the pressure roll is thereafter applied to the coil at a lower pressure.

3. Apparatus according to claim **2**, wherein the knife and pressure roll are operated by respective pneumatic cylinders which are mutually programme controlled so that the pressure roll is first moved to apply the moving web to an adhesive-coated tubular core on or forming part of the empty mandrel and immediately thereafter the knife is moved at a greater speed to sever the web and is thereupon withdrawn, whereafter the pneumatic cylinder operating the pressure roll is relieved.

4. Apparatus according to claim **2**, further including a pivotable lever and wherein said pressure roll is mounted to one end of said pivotable lever, and a displaceable counterweight carried by the other end of said lever for adjusting the effective weight of said pressure roll lying on the coil under gravity after termination of the pressure.

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