April 1, 1958 R. W. PHELPS 2,828,926

WINDER FOR WEB MATERIALS

Filed June 6, 1955 2 Sheets-Sheet 1

FIG-1

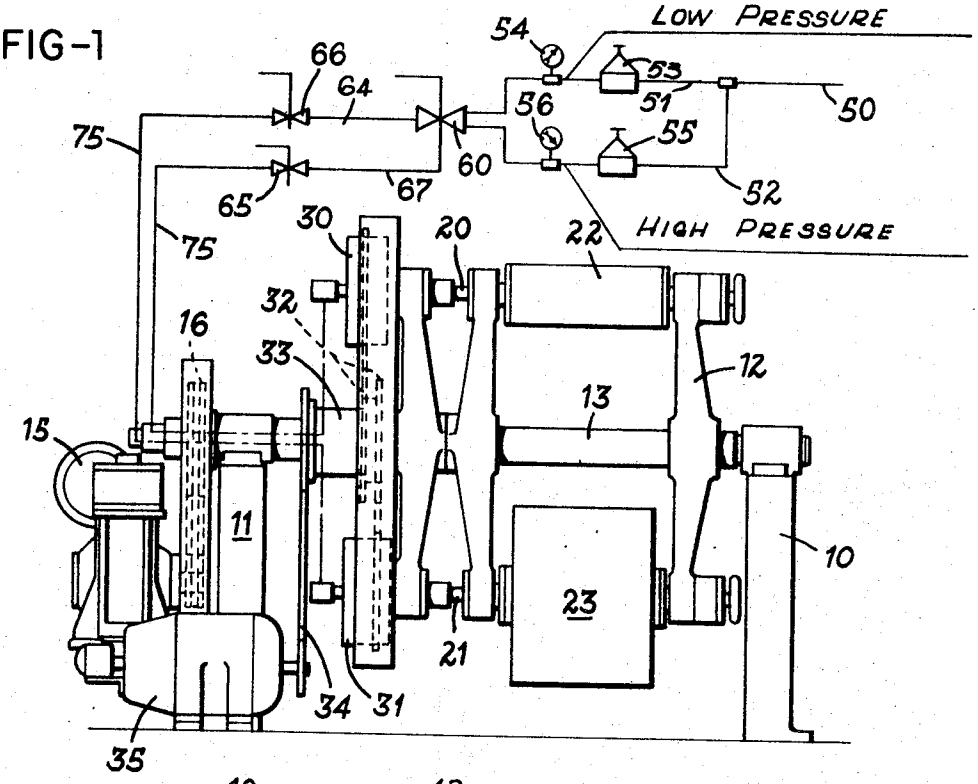
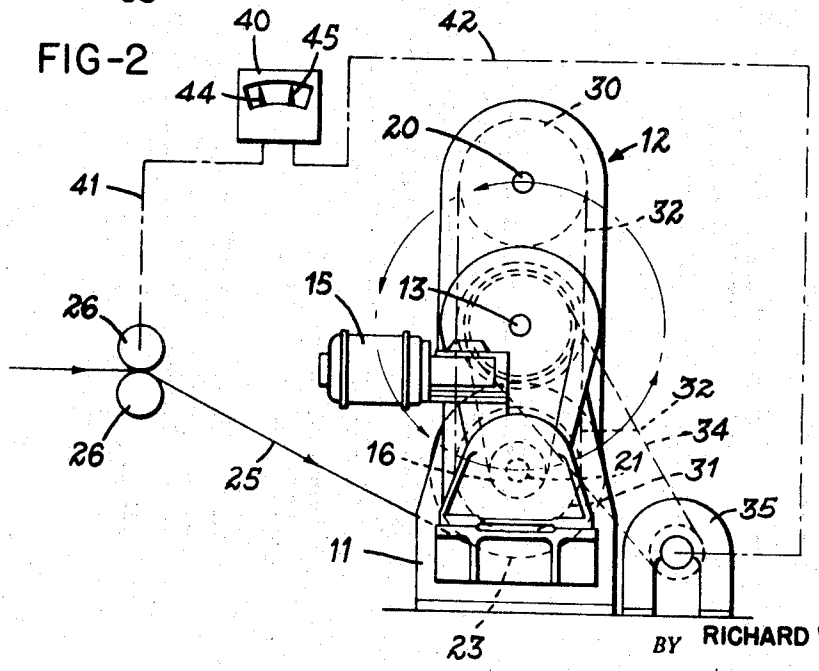


FIG-2



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FIG-3

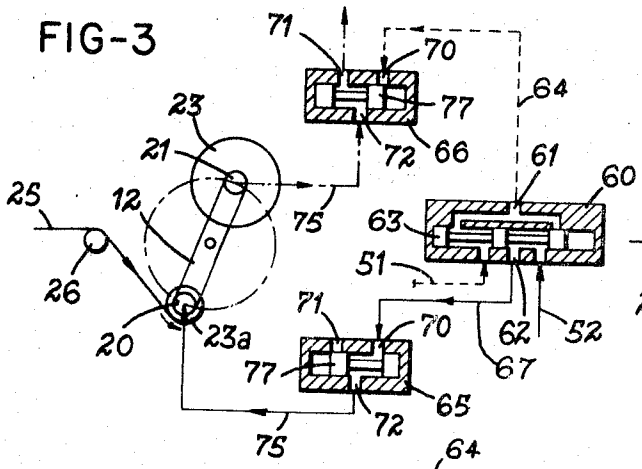


FIG-4

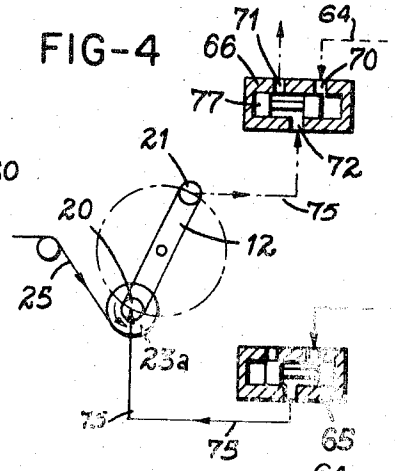


FIG-5

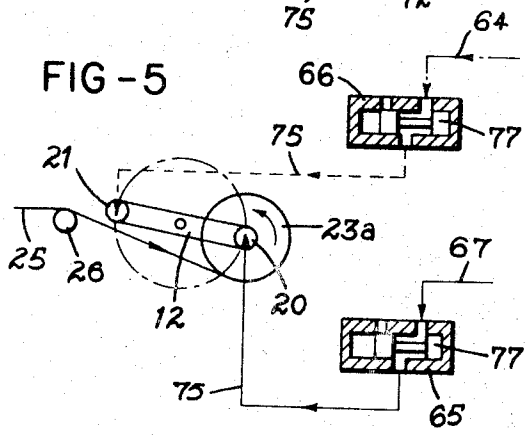


FIG-7

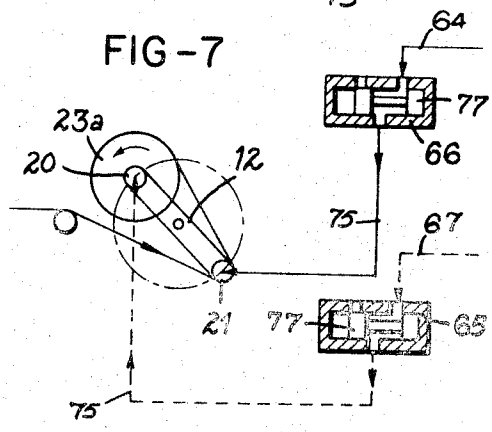


FIG-6

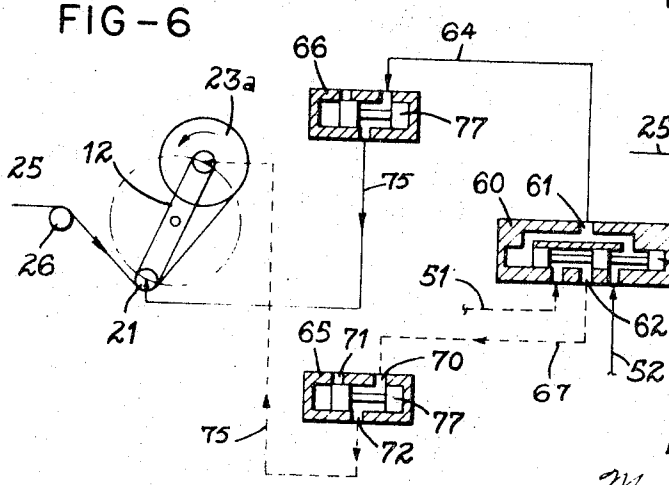
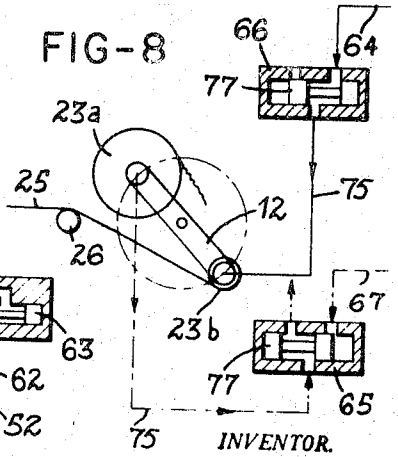


FIG-8



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2,828,926

WINDER FOR WEB MATERIALS

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Application June 6, 1955, Serial No. 513,369

5 Claims. (Cl. 242—75.5)

This invention relates to the continuous winding of web materials.

It is a primary object of the invention to provide a continuous winder for web materials which is of simple basic construction requiring a minimum of complex parts and controls while at the same time being capable of winding multiple successive rolls from an advancing web and of changing from a full roll to a new core without slackening of the speed of the advancing web.

Another object is to provide a continuous winder as outlined above which can be produced at economical cost in a simplified construction wherein control of the operation during roll changing is effected manually in accordance with observed operating conditions, and which at the same time is readily adaptable to automatic operation.

An additional object of the invention is to provide a continuous winder for web materials wherein the speeds of the full roll and the new core are continuously controlled during roll changing by variation of the pressure supply to friction clutches through which each core shaft is connected to a source of constant horsepower driving power in order to assure properly maintained tension in the web and a smooth and even start on the new core.

Further objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a somewhat diagrammatic front view of a continuous winder constructed in accordance with the invention;

Fig. 2 is a view looking from left to right in Fig. 1; and

Figs. 3 to 8 inclusive are diagrammatic views illustrating successive stages in the operation of the winder of Figs. 1 and 2 during the change from a full roll to a new core.

Referring to the drawings, which illustrate a preferred embodiment of the invention, the end stands **10** and **11** in Figs. 1 and 2 form the base frame for a double-armed reel **12** on a shaft **13** connected with an indexing drive motor **15** for effecting controlled rotation of the reel, the motor **15** being shown as of the gearhead type connected with shaft **13** by a belt or chain drive **16**. The reel **12** is provided with a pair of core spindles **20** and **21** each adapted to carry a core **22** on which a roll **23** is to be wound. Indexing of the reel controls the path of the web **25** to successive cores **22** from means such as a pair of pull rolls **26** for delivering the web to the winder at a predetermined controlled speed, which is readily determined by the speed of the machine from which the web is supplied to the winder.

Each of these spindles **20** and **21** is provided with its individually controlled friction clutch **30** and **31** respectively, and the driving members of both clutches are connected by chain drives **32** with a sleeve **33** free on shaft **13**. This sleeve **33** is driven through a chain drive **34**

by a constant horsepower motor **35** or equivalent means for continuously driving sleeve **33** at a constant power output. In operation, this drive is correlated with the speed of the web to maintain substantially constant tension in the web by driving successive winding rolls at an angular speed which decreases at a proper constant rate to maintain an effectively constant peripheral speed for the roll. A dual meter **40** is connected at **41** with one of the pull rolls **26** and at **42** with the motor **35** to provide a continuous indication of the feet per minute speed of the web and of the driven core, through pointers **44** and **45** respectively.

In accordance with the invention, the winder is equipped with a control system for the clutches **30** and **31** which provides for selective individual engagement and disengagement of the clutches and also for selectively effecting high pressure engagement of either clutch together with low pressure engagement of the other clutch. A main pressure air line **50** leads into a pair of branch lines **51** and **52**. The line **51** includes a pressure regulator **53** set to provide relatively low pressure as indicated by the gauge **54**, for example 5 p. s. i., and line **52** includes a similar pressure regulator **55** and gauge **56** set to provide relatively high pressure, such as 75 p. s. i. The resulting low and high pressure lines **51** and **52** lead to a 4-way valve **60**, and for convenience of illustration, the low pressure line is indicated in Figs. 3–8 by a series of dashes to distinguish from the solid high pressure line **52**.

The valve **60** accordingly has a pair of outlet ports **61** and **62** which are reversible to provide either high or low pressure, by shifting the valve spool **63**. The port **61** is connected by a line **64** to a 3-way valve **66** for controlling operation of clutch **30**, and the port **62** is similarly connected to a similar control valve **65** for the clutch **31** by a line **67**. As shown in Fig. 3, each of valves **65** and **66** includes a pressure port **70**, an exhaust port **71** and an intermediate port **72** from which the line **75** leads to the associated clutch. The spool **77** in each of valves **65** and **66** is shiftable to effect alternate connection of port **72** with ports **70** and **71** for engagement and disengagement of the associated clutch, this showing of the valves **60**, **65** and **66** being illustrative of any suitable functionally equivalent valve.

The successive stages of roll changing on the winder of Figs. 1 and 2 are shown in Figs. 3–8. In Fig. 3, the roll **23***a* is winding on the spindle **20** while a full roll **23** is ready to be removed from the spindle **21**. The valve **60** is accordingly set to provide high pressure to valve **65**, while low pressure is being provided to valve **66**. Valve **65** is operated to supply the high pressure in turn to clutch **30** for high pressure engagement of this clutch, but valve **66** is in the reverse position to cause disengagement of clutch **31** so that the full roll **23** can be removed from spindle **21** and a new core substituted thereon. As shown in Fig. 3, the clutch **31** is accordingly connected to exhaust as indicated by the dot-dash line **75** to port **72** of valve **66**.

Fig. 4 represents an intermediate stage during the winding of roll **23***a*, and the valve positions remain the same as in Fig. 3, the only change being that the new empty core **22** has been inserted on spindle **21**. Fig. 5 represents the conditions just prior to roll changing, with the roll **23***a* nearing completion. At this stage, the reel has been indexed to bring the new core **22** near but not in contact with the web, and valve **66** has been shifted to supply low pressure to the clutch **31**. The spindle **21** and new core **22** are accordingly being driven through clutch **31** but at the relatively low same angular speed as the almost completed full roll **23***a*. Since there is no load on spindle **21** during this stage of operation, the low

pressure engagement of its clutch **31** is adequate for the desired initial rotation.

Fig. 6 shows the positions of the parts at the beginning of the actual roll change. The valve **60** has now been reversed to supply high pressure to valve **66** and low pressure to valve **65**. Since clutch **30** is therefore now engaged only with low pressure, it will begin to slip and thereby to permit the drive motor **35** to accelerate and to increase the speed of new core **22** on spindle **21**. At the same time, the limited drive force through the slipping clutch **30** to spindle **20**, together with the momentum of the almost completed roll **23***a*, will maintain proper tension in the web.

The operator carefully observes the meter **40** during this stage of the operation, and at the same time the reel is indexed further to the position in Fig. 7 in which the web **25** wraps a substantial portion of the new core **22**. The valve settings remain the same in Fig. 7 as in Fig. 6, as shown. As soon as the speeds of the web and the new core are matched, as indicated by superpositioning of the pointers **44** and **45**, the operator severs the web and starts it on the new core **22**, this being readily done manually by breaking the web downwardly in such manner that its severed end is directed into the nip between the inrunning side of the web and the new core **22**. This stage of the operation is indicated in Fig. 8, and as soon as the web has been severed and started on the new core, the valve **65** is shifted to disengage clutch **30**. Thereafter as the new roll **23***b* continues to build up on spindle **21**, the full roll **23***a* is removed and replaced by a further new core, and preferably the reel will be indexed in the reverse direction from its position in Fig. 8 back to the position of Fig. 3 for this final step in roll changing.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A continuous winder for web materials in combination with means for delivering the web at a maintained predetermined speed, comprising a frame, a reel supported for rotation on said frame, a pair of roll supporting spindles carried by said reel for rotation therein and therewith, a pair of friction clutches carried by said reel for selectively driving said spindles respectively, means for continuously driving both said clutches at a substantially constant power output correlated with said web speed to maintain substantially constant tension in the web, means for indexing said reel to control the path of the web from said web delivering means to said spindles, means for selectively engaging and disengaging said clutches to drive a winding roll on one of said spindles while replacing a full roll on the other said spindle with a new core, regulating means for effecting high and low frictional engagement of each of said clutches, and means for controlling said regulating means in predetermined relation causing high frictional engagement of said clutch on said winding roll spindle and simultaneous low frictional engagement of said clutch on said new core spindle during initial acceleration of said new core spindle prior to roll changing and thereafter causing low frictional engagement of said clutch on said winding roll spindle and simultaneous high frictional engagement of said clutch on said new core spindle during acceleration thereof to said web speed and the subsequent roll changing operation.

2. A continuous winder for web materials in combination with means for delivering the web at a maintained predetermined speed, comprising a frame, a reel supported for rotation on said frame, a pair of roll supporting spindles carried by said reel for rotation therein and therewith, a pair of friction clutches carried by said reel for selectively driving said spindles respectively, means for continuously driving both said clutches at a substantially constant power output correlated with said web speed to maintain substantially constant tension in the web, means for indexing said reel to control the path of the web from said web delivering means to said spindles, means for selectively engaging and disengaging said clutches to drive a winding roll on one of said spindles while replacing a full roll on the other said spindle with a new core, regulating means for effecting high and low frictional engagement of each of said clutches, means for controlling said regulating means in predetermined relation causing high frictional engagement of said clutch on said one spindle and simultaneous low frictional engagement of said clutch on said other spindle during initial acceleration of said other spindle prior to roll changing and thereafter causing low frictional engagement of said clutch on said one spindle and simultaneous high frictional engagement of said clutch on said other spindle during acceleration of said other spindle to said web speed and the subsequent roll changing operation, and means for reversing said controlling means to initiate a further roll change from said other spindle to said one spindle.

3. A continuous winder for web materials in combination with means for delivering the web at a maintained predetermined speed, comprising a frame, a reel supported for rotation on said frame, a pair of roll supporting spindles carried by said reel for rotation therein and therewith, a pair of fluid pressure clutches carried by said reel for selectively driving said spindles respectively, means for continuously driving both said clutches at a substantially constant power output correlated with said web speed to maintain substantially constant tension in the web, means for indexing said reel to control the path of the web from said web delivering means to said spindles, means for selectively engaging and disengaging said clutches to drive a winding roll on one of said spindles while replacing a full roll on the other said spindle with a new core, and means for regulating the operating pressure to said clutches to provide high pressure engagement of said clutch on said winding roll spindle and low pressure engagement of said clutch on said new core spindle during initial acceleration of said new core spindle and to provide for low pressure engagement of said clutch on said winding roll spindle and high pressure engagement of said clutch on said new core spindle during acceleration thereof to said web speed and roll changing.

4. A continuous winder for web materials in combination with means for delivering the web at a maintained predetermined speed, comprising a frame, a reel supported for rotation on said frame, a pair of roll supporting spindles carried by said reel for rotation therein and therewith, a pair of pressure fluid friction clutches carried by said reel for selectively driving said spindles respectively, means for continuously driving both said clutches at a substantially constant power output correlated with said web speed to maintain substantially constant tension in the web, means for indexing said reel to control the path of the web from said web delivering means to said spindles, separate supply lines for high and low pressure fluid for said clutches, reversible valve means for connecting said supply lines to respective said clutches, and control valve means between each said clutch and said reversible valve means for selective operation of said clutches in conjunction with said reversible valve means to provide high pressure engagement of said clutch on said winding roll spindle and low pressure engagement of said clutch on said new core spindle during initial acceleration of said new core spindle and to provide for low pressure engagement of said clutch on said winding roll spindle and high pressure engagement of said clutch on said new core spindle during acceleration thereof to said web speed and roll changing.

5. A continuous winder for web materials in combination with means for delivering the web at a maintained predetermined speed, comprising a frame, a reel sup-

ported for rotation on said frame, a pair of roll supporting spindles carried by said reel for rotation therein and therewith, a pair of pressure fluid friction clutches carried by said reel for selectively driving said spindles respectively, means for continuously driving both said clutches at a substantially constant power output correlated with said web speed to maintain substantially constant tension in the web, means for indexing said reel to control the path of the web from said web delivering means to said spindles, a separate control valve connected with each said clutch and having a pressure port and an exhaust port for selectively providing operating pressure to said

clutch or causing disengagement thereof, separate supply lines for high and low pressure fluid for said clutches, and reversible valve means connected between said supply lines and said control valves to provide high pressure for operation of one said clutch together with low pressure for operation of the other said clutch and vice versa.

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