

[54] **DEVICE FOR CONTROLLING THE
LAUNCHING OF A REEL OF WEB IN AN
UNWINDER WITH AUTOMATIC REEL
CHANGE**

[76] Inventor: **Francesco Osta**, Via Spanzotto 3,
15.033 Casale Monferrato
(Alessandria), Italy
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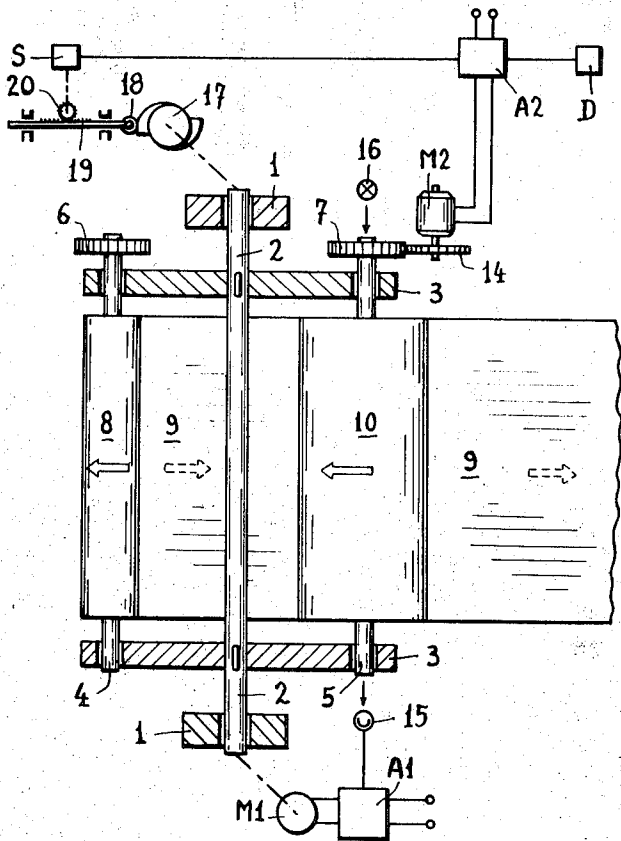
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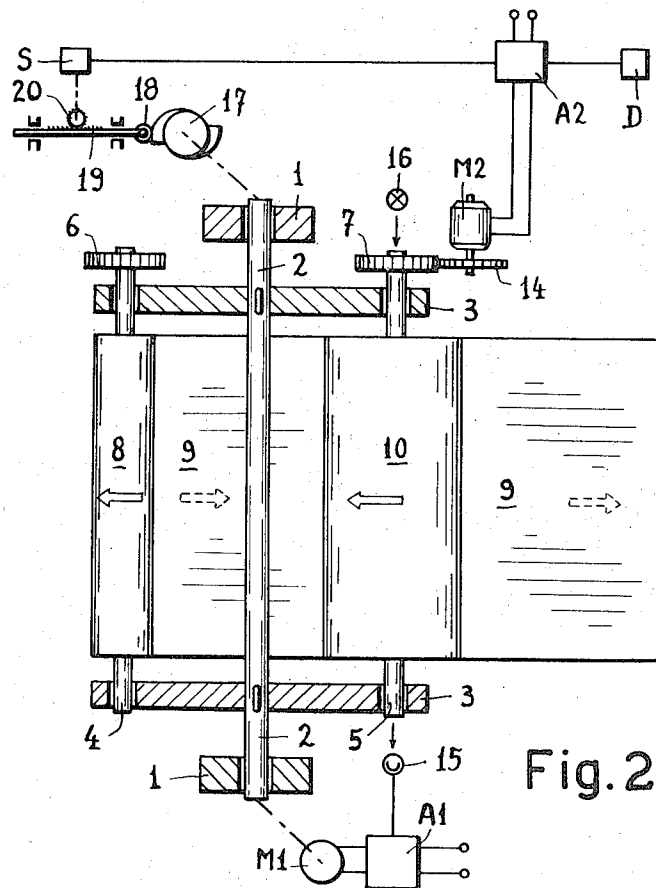
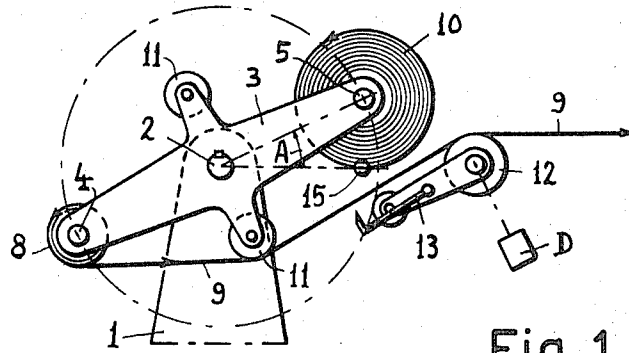
Primary Examiner—John W. Huckert
Assistant Examiner—Edward J. McCarthy
Attorney, Agent, or Firm—Young & Thompson

[57] **ABSTRACT**

An automatic reel change unwinder wherein the reel holder arms are controlled by a change motor stopped by a detecting device, and a signal generator produces a signal depending on the stop position of the said arms for generating, in a computer, a signal suitable for controlling a launching motor which accelerates a new reel intended to replace an exhausted one.

4 Claims, 2 Drawing Figures





DEVICE FOR CONTROLLING THE LAUNCHING OF A REEL OF WEB IN AN UNWINDER WITH AUTOMATIC REEL CHANGE

BACKGROUND OF THE INVENTION

The present invention relates to a device for controlling the correct launching of a reel of web, particularly a web of delicate material such as thin bare aluminum or the like, intended to be utilized in an unwinding apparatus after automatic replacement, upon exhaustion, of a reel previously in course of unwinding.

Automatic change unwinders are intended to supply a web to a machine, such as for instance a rotary press, a coating machine, a laminating machine or other machines having similar requirements, without discontinuing or slowing down the supply of the web in the period of reel change during which the head portion of the web coming from a new reel is being connected to the tail portion of the web coming from an exhausted reel. In order to allow effecting this operation, an automatic change unwinder comprises, as is well-known: a pair of reel holder arms mounted rotatably on a fixed support member, so that an exhausted reel may be replaced with a new one while a further reel is being unwound; a motor for moving said rotatable arms; a device for stopping the rotation of said motor and said arms as the new reel is being positioned with its periphery in a predetermined position, generally detected by means of a photoelectric cell, suitable to effect the change operation; and a cutting and splicing mechanism operable at the moment of the change of the reel. In order to allow effecting correctly the splicing of the head portion of the web of the new reel with the tail portion of the web of the exhausted reel it is necessary that the new reel be previously launched, i.e., accelerated in rotation by means of a special motor until it reaches a peripheral speed equal, within restricted tolerances, to the linear speed of the web which is being rewound. The linear speed is known through measuring devices already present in the machine, and the problem is to measure the peripheral speed of the reel which is being launched, in order to equalize said two speeds through suitable control of the launching motor. The measurement of the peripheral speed is necessary because the adjustment could not be effected on the basis of the knowledge only of the angular speed of the reel which has an inconstant diameter both for systematic and accidental reasons. To this end, in the prior art constructions a roller or a small belt, coupled with a speedometer dynamo or other measuring device, is applied against the reel which is being launched; however, in the case of webs of delicate materials, as typically the thin bare aluminum webs, such application causes damage to several layers of the web of the reel, with the consequent disadvantages.

BRIEF SUMMARY OF THE INVENTION

The object of the present invention is to provide a device for controlling the launching of the reel, of the above mentioned type, in which no physical contact with the surface of the reel is required, thereby avoiding the relative disadvantages, such aim being attained without introducing into the unwinding apparatus any complication capable of increasing considerably its cost.

This object is obtained according to the invention by an automatic reel change unwinder intended to con-

nect to the web in course of unwinding of an exhausted reel the web of a new reel rotated by a launching motor, and comprising reel holder arms which are movable under the action of a change motor as well as means for stopping said arms in a position in which the periphery of the new reel passes through a predetermined point defined by a detecting device without physical contact with the reel, characterized in that said arms are connected with means detecting the angular position which said arms assume in said stop position, in order to generate a signal depending on said angular position and consequently on the actual diameter of the new reel, and that a computer is provided which is connected with said detecting means in order to receive a signal depending on the diameter of the new reel and is connected with a source of signal depending on the linear speed of the web which is being unwound, said computer being arranged to control the angular speed of said launching motor in such a way that, considering the detected diameter of the new reel, the latter assumes a peripheral speed which is equal, within the predetermined tolerances, to said linear speed of the web which is being unwound.

In this way, according to the invention, advantage is drawn from the already existing device to position the new reel in a position suitable for the change, in order to obtain an information about the actual diameter of the reel and thus be able to control correctly the launching of said reel without having to have recourse to a direct measuring of its peripheral speed.

BRIEF DESCRIPTION OF THE DRAWING

The features of the invention will appear in a more detailed manner from the following description of an illustrative but not limitative embodiment shown in the accompanying drawing, wherein:

FIG. 1 is a side elevational view of an automatic change unwinder according to the invention, some parts of it being omitted, and

FIG. 2 is a partially sectional plan view thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The unwinder comprises fixed supports 1 supporting a shaft 2 which can be rotated by a motor M1 and on which two rocker arms 3 are keyed, which are adapted to carry, adjacent their ends, spindles 4,5 provided with transmission means 6 and 7 respectively and intended each to receive a web reel 8,10 to be unwound in the apparatus. The reel 8, in course of being unwound, supplies a web 9, whereas reel 10, which is the new reel, is intended to replace the reel 8 after the latter has been exhausted. Rollers 11, also supported by the arms 3 in quadrature with respect to the spindles 4,5, serve for leading the web 9 which passes also on a roller 12 mounted on a fixed axis and in the proximity of which is positioned a roller-and-knife device 13 serving to cut the web and to connect it to the web of the new reel 10. The transmission means 6,7 of the spindles 4,5 are adapted to be entrained by a complementary transmission means 14 of a launching motor M2 in order to accelerate the reel the unwinding of which is desired to be initiated. A lamp 16 and a photoelectric cell 15 are provided, which are positioned in such a way that a beam of light directed by the lamp 16 towards the cell 15 is intercepted by the periphery of the reel 10 when the latter reaches the correct position (shown in FIG.

1) for the reel change operation; the photoelectric cell 15 is connected to a feeding circuit A1 of the change motor in order to stop said motor and consequently the arms 3 as soon as the correct change position of the reel 10 has been reached. The parts which have been described above as well as their operation are well-known.

Naturally, since the change motor M1 at the beginning of the change operation is stopped by the detector device 15-16 as soon as the reel 10 reaches a position in which its periphery intercepts the beam of light which is directed from the lamp 16 to the cell 15, the arm 3 stops in a position which depends on the actual diameter of the reel 10. More exactly, the angle A formed by a straight line connecting the axis of shaft 2 with the axis of spindle 5 and a straight line connecting the axis of shaft 2 with the detecting point defined by the photoelectric cell 15 is an unequivocal function of the diameter of the reel. Consequently, the measurement of the angular distance of arm 2 in its stop position in respect of a position selected as origin, permits one to determine in an unequivocal manner the diameter of reel 10. On the other hand, the linear speed of web 9 is known, it being possible to measure it for example by means of a speedometer dynamo D keyed onto the shaft of the transmission roller 12, as indicated by way of example in FIG. 1; but actually, there is usually already available in the apparatus a signal depending on said speed, and consequently the speedometer dynamo D substantially symbolizes the origin of such signal. The ratio between the linear speed of web 9 and the diameter of reel 10 is the angular speed which has to be imparted to the latter by the launching motor M2 in order to effect correctly the change operation.

Therefore, by positioning a computer A2 in such a way as to allow receiving from a signal generator S actuated by the arms 3 a signal as a function of the diameter of the reel, receiving from the origin D a signal as a function of the linear speed of web 9, calculating the ratio between said signals and feeding the launching motor M2 in such a way as to impart to it the angular speed thus calculated, the correct peripheral speed of reel 10, which allows one to effect the change operation, is certainly obtained.

To generate the signal which is a function of the diameter of the reel, according to the angular position of the arms 3, on the shaft 2 which supports said arms can be keyed a cam 17 whose cam follower 18 displaces a rack 19 engaging a gear 20 which displaces the signal generator S which may consist for instance of a potentiometer.

However, it is obvious that many other types of signal generators can be used for the purpose of detecting the angular position of arms 3, shaft 2 and any other part connected with these elements. The computer A2 can in turn be of any type known in the art for the determination of a ratio between signals. Generally, it is advantageous to operate on electric signals and consequently to use, as computer A2, an electronic computer; however, the signals and the computer could also be of mechanical, hydraulic or pneumatic, fluidic or mixed nature. The motor M2 is preferably a direct current electromotor but it could also be of another type.

It should also be understood that, although reference was made to the known system for stopping in position the arms 3 under the control of a photoelectric cell system 15, the latter could be replaced by any other type

of position or proximity detector, without modifying in any way the application of the concepts of the invention.

The operation of the invention will be evident from the above: when in the course of unwinding, the reel 8 is nearly exhausted, the operation of the reel change mechanism according to the present invention is commenced. The reel change motor M1 rotates the shaft 2 to bring the new reel 10 toward the correct change position. The periphery of reel 10 intercepts light from lamp 16 and photoelectric cell 15 signals feeding circuit A1 to stop motor M1.

The signal generator arrangement 17-20 responds to the stopped position of shaft 2 to send a signal from signal generator S to computer A2 depending on the angle A, that is, depending on the actual diameter of the new reel. The ratio calculating computer A2 receives the signal and generates a corresponding output signal which operates launching motor M2 in such a way that the peripheral speed of the new reel 10 is brought up to the linear speed of the web 9, which latter speed is detected for example by roller 12 whose signal is fed by D to computer A2. Thereafter, splicing of the old and new webs together is effected in any known manner.

Having thus described my invention, what I claim is:

1. An automatic reel change unwinder for connecting a web from a new reel to a web in course of unwinding from an exhausted reel, comprising a stationary structure, reel holder arms rotatably mounted on said structure, a change motor connected to said reel holder arms for controllably rotating said arms, a detecting device operating at a stationary predetermined point for detecting without physical contact when the periphery of a reel carried by said reel holder arms reaches said predetermined point during rotation of said arms, a connection between said detecting device and said change motor for stopping said change motor upon operation of said detecting device, signal generator means connected to said arms for generating a signal depending upon the angular position of said arms in the stopped condition, a tachometric signal generator supplying a signal depending upon the linear speed of the web in course of unwinding, a computer connected to both said signal generators for receiving said signals and for generating from said received signals an output signal depending upon the relation between said signal of angular position of said arms and said signal of linear speed of the web, a launching motor connected to and controlled by said computer and connected to said new reel for accelerating the same up to a peripheral speed depending upon said output signal generated by said computer that corresponds, within a predetermined tolerance, to the linear speed of the web in course of unwinding, and a cutting and splicing mechanism operable when said peripheral speed of the new reel has been attained.

2. An unwinder as set forth in claim 1, wherein a shaft is journaled on said stationary structure, said reel holder arms are mounted on said shaft and said signal generator means comprise a cam connected to said shaft, a cam follower displaceable by said cam, and a signal generator electric circuit connected to and controlled by said cam follower.

3. An unwinder as set forth in claim 1, wherein both said signal generators are of mechanical electrical nature, the signals generated thereby are of electrical na-

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ture, and said computer is an electronic computer of the type producing an electric signal corresponding to the ratio between the electric signals received from said signal generators.

4. An unwinder as set forth in claim 1, wherein said detecting device comprises a lamp, said lamp being directed to send a beam of light intersecting at said point the path followed by said new reel during rotation of said arms, a photoelectric cell disposed in the path of said beam of light on the side of said path of the reel 10

which is opposite said lamp so as to be struck by the beam of light of said lamp when said beam is not interrupted by the presence of said new reel, and a feeding circuit being connected to and controlled by said photoelectric cell in order to switch off said change motor when the periphery of said new reel, by reaching its predetermined stop position, interrupts said beam of light.

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