March 5, 1968 M. HILL 3,371,879

YARN WINDING APPARATUS

Filed July 16, 1965 2 Sheets-Sheet 1

Fig. 1.

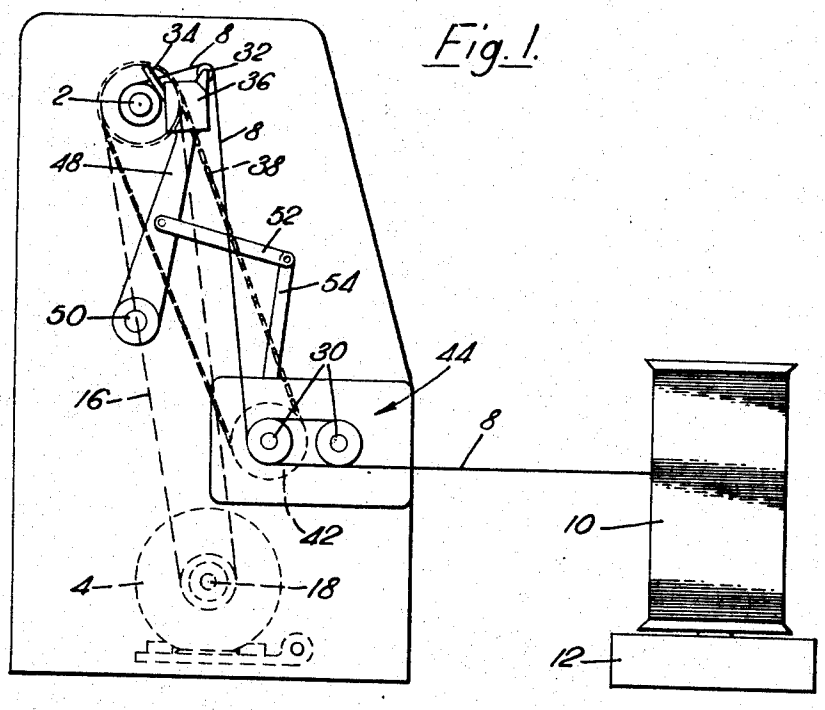
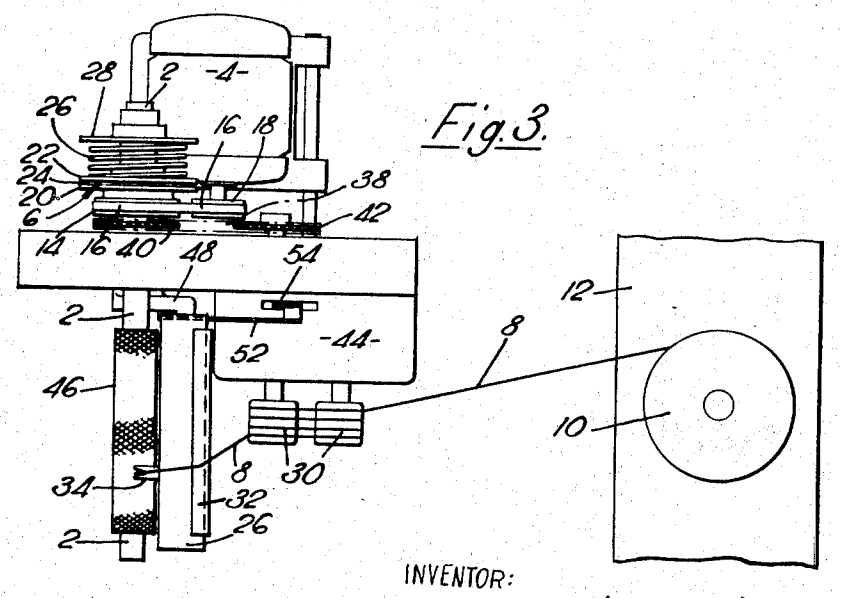


Fig. 3.



INVENTOR:

Moore Hill

BY Dowell & Dowell

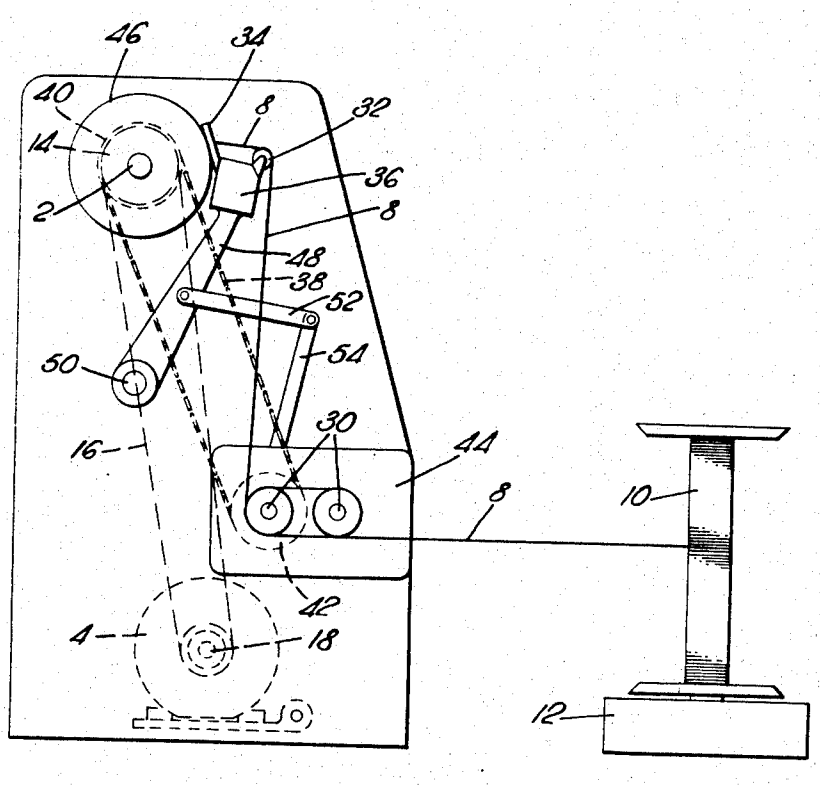
ATTORNEYS

March 5, 1968 M. HILL 3,371,879

YARN WINDING APPARATUS

Filed July 16, 1965 2 Sheets-Sheet 2

Fig. 2.



INVENTOR:
Moore Hill
BY
Dowell & Dowell
ATTORNEYS

United States Patent Office 3,371,879
Patented Mar. 5, 1968

3,371,879

YARN WINDING APPARATUS

Moore Hill, Belfast, Northern Ireland, assignor to James Mackie & Sons Limited, Belfast, Northern Ireland

Filed July 16, 1965, Ser. No. 472,553
Claims priority, application Great Britain, July 20, 1964, 29,490/64
3 Claims. (Cl. 242—45)

ABSTRACT OF THE DISCLOSURE

A yarn winding or spooling machine having haul pulleys positioned to act upon the yarn between the let-off and take-up package spindles to positively drag yarn from the rotating let-off package, the haul pulleys being driven by a variable speed mechanism, means being provided to increase the speed of the haul pulleys and hence the rate of delivery of the yarn to the take-up package, as the diameter of the package being wound increases.

This invention relates to yarn winding apparatus.

In the normal form of yarn winding apparatus the yarn is led directly from the let-off package (for example a bobbin on a bobbin rail) to a take-up spindle where it is wound as a package (for example a spool). If the take-up or winding spindle is driven at a constant speed then as the diameter of the take-up package increases the surface speed of the yarn rises; also, as the diameter of the let-off package decreases at the same time due to the yarn being unwound from it, it must of necessity be rotated at an increased speed. Usually the let-off bobbin is subjected to drag by friction means so as to prevent over-run and spillage of the yarn should the machine have to be stopped during winding, and this results in an increase of yarn tension leading to bad package formation and possible yarn breakage.

In a yarn winding or spooling machine in accordance with the invention haul pulleys or their equivalent, e.g., a capstan, are provided positively to act on the yarn between the let-off and take-up spindles, the haul pulleys being driven through a variable speed mechanism. Variations in the tension of the yarn being pulled from the let-off package by the pulleys are then not transmitted to the take-up package so that this source of tension variation is eliminated from the yarn being wound on the take-up package leading to better package shapes being obtained.

Means are preferably provided to adjust the variable speed mechanism during winding to increase the speed of the haul pulleys and hence the rate of delivery of the yarn to the take-up package, as the diameter of the package being wound, increases. The rate of yarn delivery can then be arranged always to be closely equal to that needed for any diameter of the package so that the speed of the take-up spindle may be kept substantially constant and at a maximum throughout winding. This leads to a decrease in the time needed for winding as compared with apparatus having constant speed haul pulleys between the let-off and take-up spindles and as compared with winders having a constant yarn speed, the take-up spindle being driven through a variable speed mechanism. In the latter case, in order to maintain a constant yarn speed, the take-up spindle must rotate at maximum speed at the beginning of winding and decrease as the spool increases in in diameter. Such a machine therefore only runs at its maximum at the commencement of winding.

If the haul pulleys are of constant speed the take-up spindle will be driven through a slipping clutch and this is preferred even when the speed of the haul pulleys can be altered, in order to ensure that there is some tension

in the yarn between the take-up package and the haul pulleys, the clutch being adjusted so as slightly to slip throughout the whole winding operation. The slipping clutch for most purposes will be of a standard type, such as a friction clutch. With such a clutch the yarn tension will tend to diminish during winding due to the fact that an increase in the package diameter gives a greater "leverage" for the retarding force applied to the slipping clutch. However, if it is found necessary or desirable for any particular yarn to vary to the frictional force provided by the clutch, a variable slipping clutch such as that described in my copending application No. 472,632 may be used.

The control means for the haul pulleys may comprise a standard variable speed gear box, adjustment of which is achieved through a linkage operated by a feeler which conveniently forms part of the traverse mechanism and which bears against the perpihery of the package being wound on the take-up spindle.

An embodiment of a yarn winding apparatus in accordance with the invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a diagram showing the aparatus in end elevation in the condition at which winding is about to start;

FIGURE 2 is a diagram corresponding to FIGURE 1 showing the condition of the apparatus towards the end of a winding operation;

FIGURE 3 is a diagrammatic plan of the apparatus.

The apparatus comprises a take-up spindle **2** driven from a motor **4** through a slipping clutch generally indicated at **6** so as to cause yarn indicated at **8** to be wound on to a former carried by the spindle **2** from a let-off package **10** which may be a bobbin on a bobbin rail **12**.

The slipping clutch **6** is driven from a pulley **14** which is a loose fit on the spindle **2** and around which a belt **16** passes to connect the pulley with the output shaft **18** of the motor **4**. A driven clutch plate **20** is rigidly connected to the pulley **14** and drives a second clutch plate **22** fixed to the spindle **2**, through a disc **24** of friction material located between the plates. The plates are biased together by means of a coil spring **26** which is compressed between the plate **22** and a collar **28** which is also fixed to the spindle **2**.

The tension of the spring **26** is made such that some slippage between the plates **20** and **22** occurs at all stages of a winding operation.

The yarn **8** is led from the bobbin **10** around haul pulleys generally indicated at **30** which positively engage the yarn and then over a roller **32** to the eye **34** of a standard traversing mechanism generally indicated at **36**. The traversing mechanism is of the standard known type used to produce a precision cross wound package and include a grooved traverse scroll (not shown) which has a follower which causes the eye **38** to be traversed along the length of the package. In order for the rotation of the scroll to be kept in step with the rotation of the package spindle it is driven through gearing (not shown) from the package spindle.

The haul pulleys **30** are driven by the motor **4** through a chain **38** connecting a chain wheel **40** which is rigidly attached to the pulley **14** and a chain wheel **42** connected to the input shaft of a variable speed gear box generally indicated at **44**.

During winding the eye **34** of the traversing mechanism which rests on the periphery of the package **46** being wound is moved outwardly in a clockwise direction as seen in FIGURES 1 and 2 causing a corresponding clockwise movement of an arm **48** which carries the traverse mechanism and which is pivotally mounted on the ma-

chine frame at 50. The arm 48 is connected to the variable speed gear box 44 through pivoted links 52, 54, clockwise movement of the link 54 being arranged to increase the speed of the haul pulleys. The internal gear arrangement of the variable speed gear box, which may be of any standard type, is made such that the movement of the lever 54 resulting from the movement of the arm 48 supporting the traverse mechanism alters the speed of the haul pulleys in such a way that the delivery of yarn from the haul pulleys to the take-up spindle is proportional to the diameter of the package being wound and hence to the speed of rotation of the periphery of that package so that the haul pulleys always deliver to the spindle just sufficient yarn to avoid increase in tension or slowing down of the spindle, any small difference being taken up by the clutch. Thus the spindle may be rotated at a substantially constant speed which can be fairly high.

The haul pulleys 30 positioned to act on the yarn 8 between the let-off and take-up packages has the effect of isolating variations in tension of the yarn from the let-off package (e.g., due to changes in the let-off package diameter during winding), from the take-up package.

I claim:

1. A yarn winding or spooling machine having haul pulleys positioned to act upon the yarn between the let-off and take-up package spindles to positively drag yarn from the rotating let-off package, the haul pulleys being driven by a variable speed mechanism; means being provided to increase the speed of the haul pulleys and hence the rate of delivery of the yarn to the take-up package, as the diameter of the package being wound increases; the means to increase the speed of the haul pulleys during winding comprising a feeler bearing against the periphery of the package being wound on the take-up spindle and directly connected to the variable speed mechanism.

2. A yarn winding or spooling machine as claimed in claim 1 in which the feeler forms a part of the yarn traverse mechanism.

3. A yarn winding or spooling machine as claimed in claim 1 in which the take-up spindle is driven through a slipping clutch.

References Cited

UNITED STATES PATENTS

2,868,467	1/1959	Lewis	242—45
3,047,247	7/1962	Kotte	242—45

FRANK J. COHEN, *Primary Examiner.*

NATHAN L. MINTZ, *Assistant Examiner.*