United States Patent [19]

Etz

[11] **3,852,847**

[45] **Dec. 10, 1974**

[54] **APPARATUS FOR MANUFACTURING TAMPONS**

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[73] Assignee: **Dr. Carl Hahn KG,** Dusseldorf, Germany

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Related U.S. Application Data

[62] Division of Ser. No. 870,783, Sept. 19, 1969, which is a division of Ser. No. 502,780, Oct. 21, 1965, Pat. No. 3,477,102.

[30] **Foreign Application Priority Data**

Oct. 22, 1964 Netherlands 6412326

[52] **U.S. Cl.** **19/144.5**

[51] **Int. Cl.** **A61l 15/00**

[58] **Field of Search** 19/144.5; 128/285, 290

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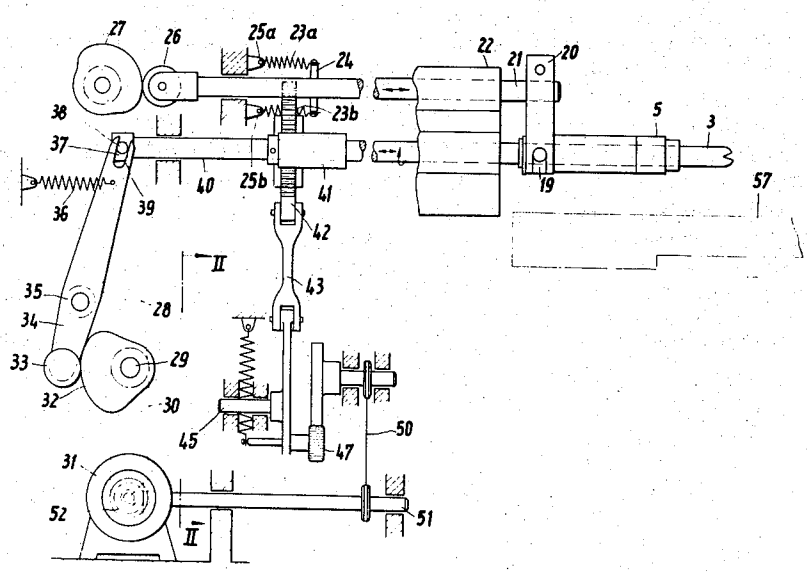
Primary Examiner—Dorsey Newton

Attorney, Agent, or Firm—Jason Lipow

[57] **ABSTRACT**

Apparatus for the production of a tampon by rolling up a wadding pad upon a rotary mandrel includes a mandrel, means forming a knotted loop of draw thread loosely around the wadding before the latter is rolled up on the mandrel, a sleeve mounted for coaxial movement over part of the mandrel but nonrotatable therewith, means for axially reciprocating the sleeve, thread guiding means carried by the mandrel and by the sleeve being shaped to intercept and direct the knotted ends of the draw thread internally of the sleeve while the mandrel is rotated and while the sleeve is axially displaced into one end of the pad being rolled up, whereby the drawn thread is wound into a flat spiral winding seated in the annular recess formed by the displacement of the sleeve into the end of the rolled pad.

9 Claims, 17 Drawing Figures



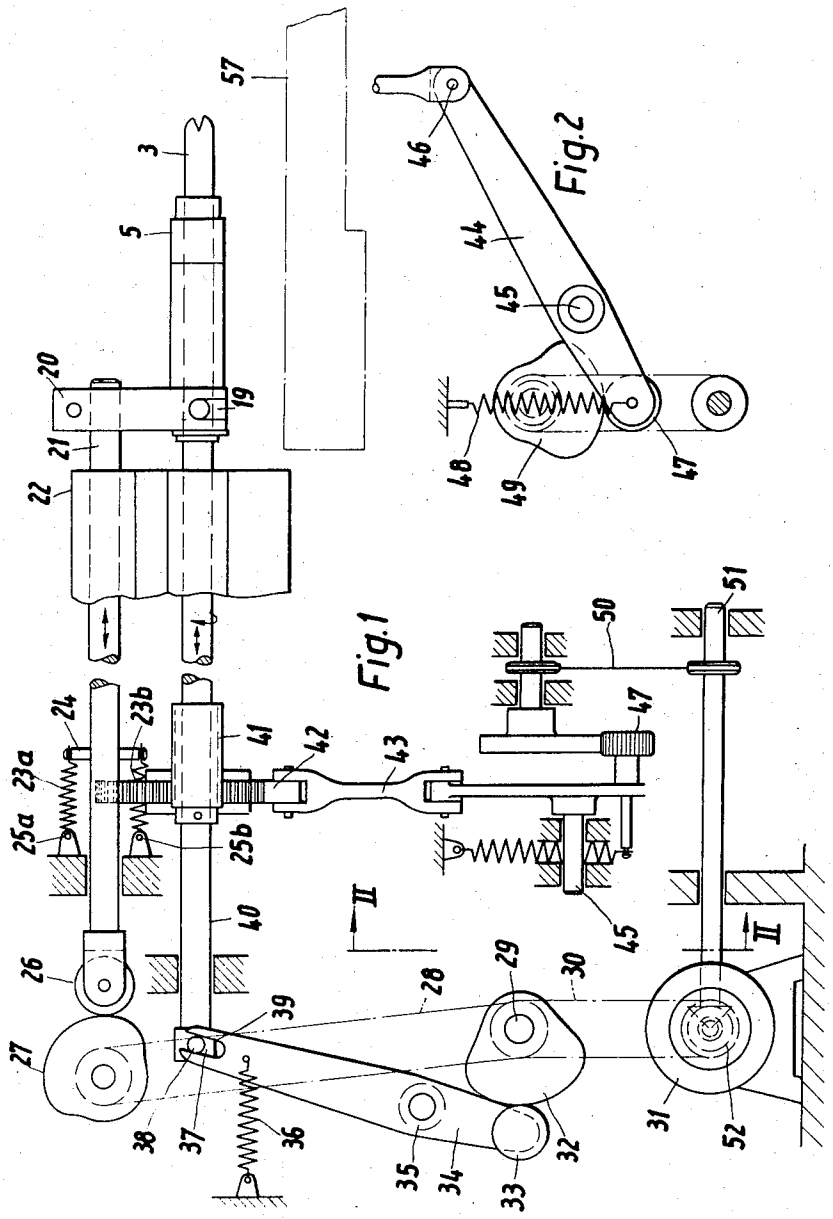


Fig.1
Fig.2
II
II

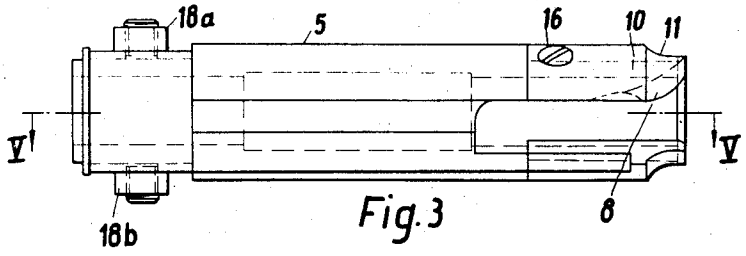


Fig. 3

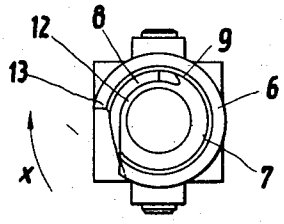


Fig. 4

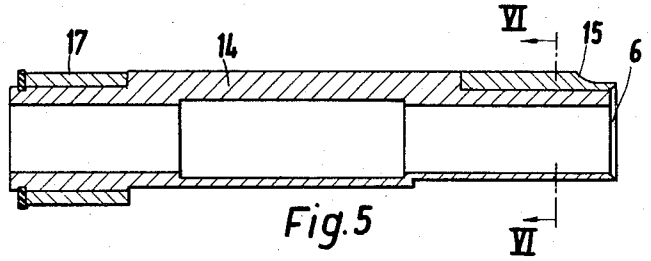


Fig. 5

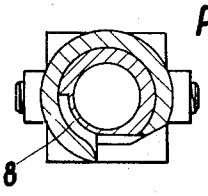


Fig. 6

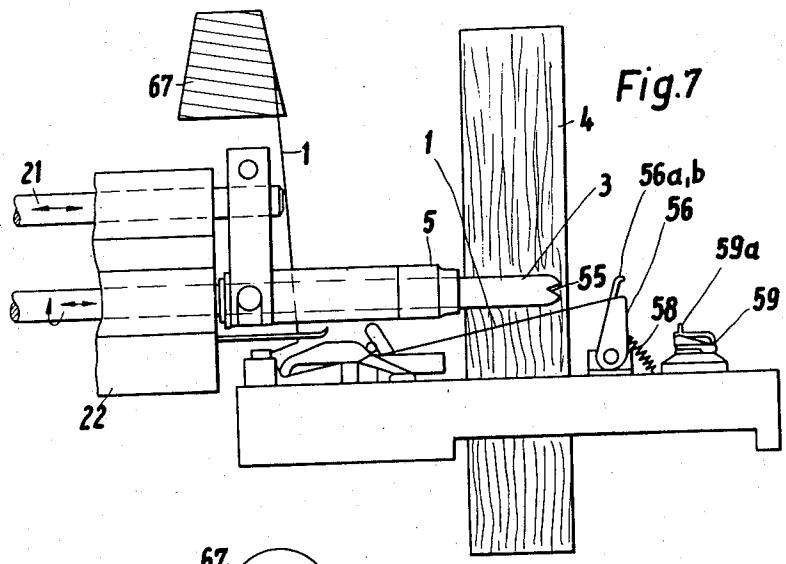


Fig.7

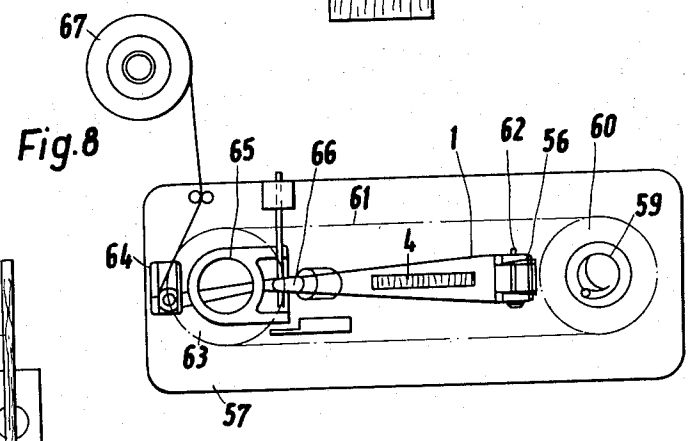


Fig.8

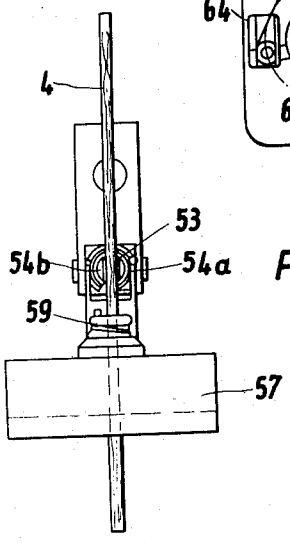


Fig.9

Fig. 10

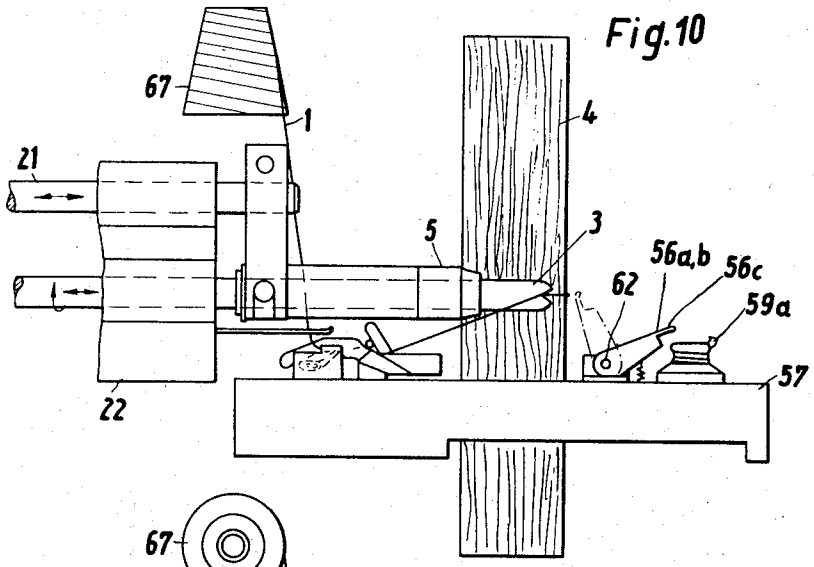
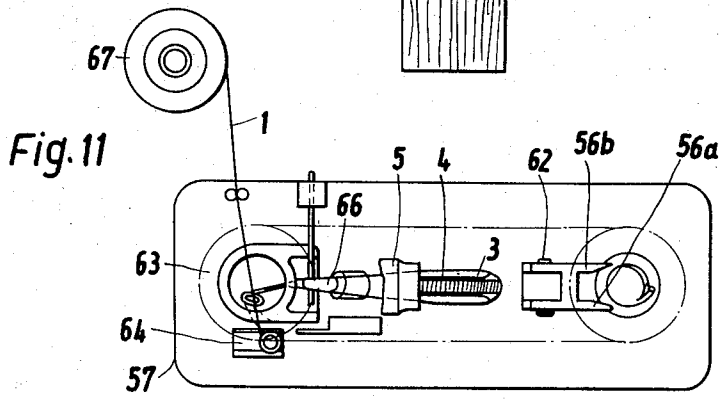


Fig. 11



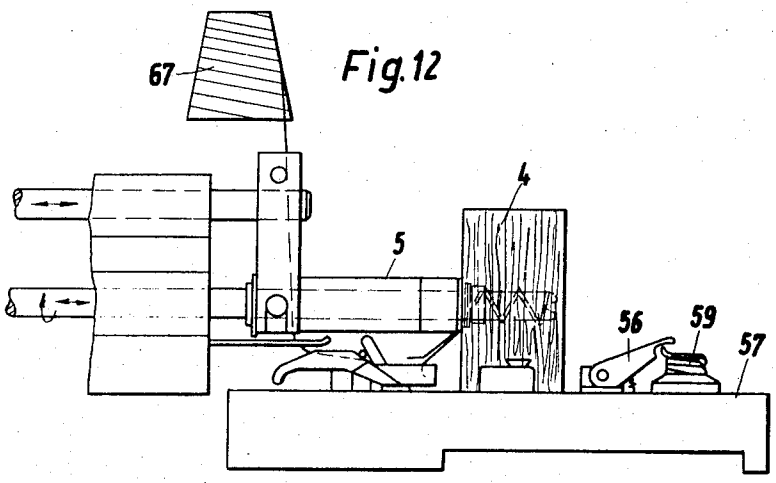


Fig.12

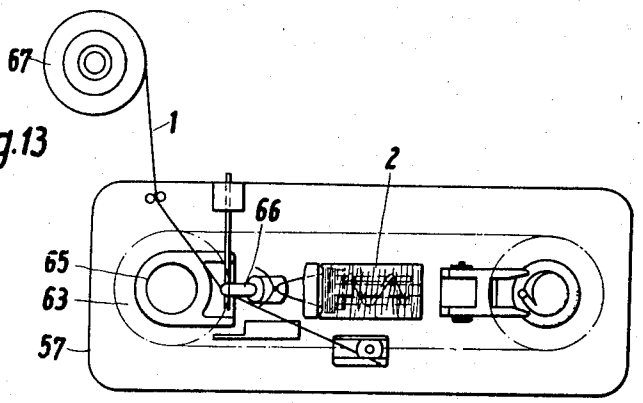


Fig.13

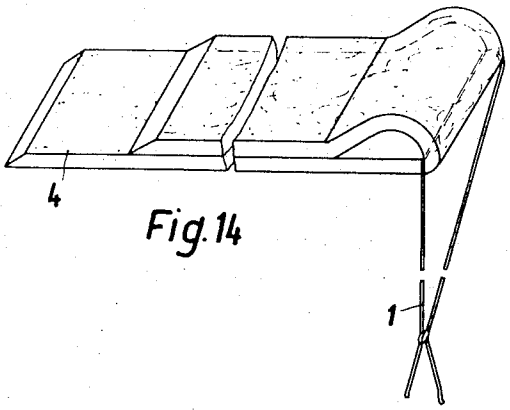


Fig. 14

Fig. 17

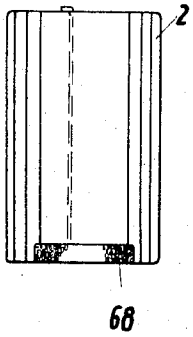


Fig. 15

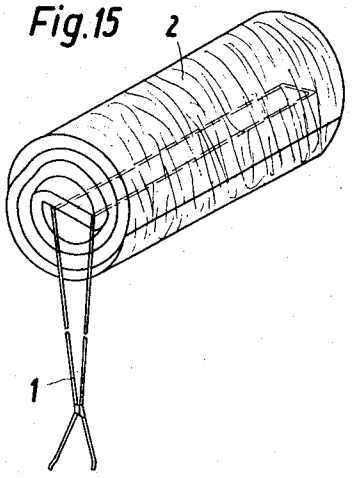
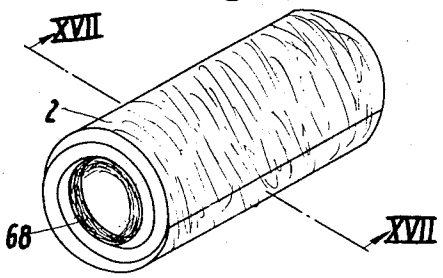


Fig. 16



APPARATUS FOR MANUFACTURING TAMPONS

This is a division of pending application Ser. No. 870,783, filed Sept. 19, 1969, which in turn was a division of Ser. No. 502,780, filed Oct. 21, 1965, now U.S. Pat. No. 3,477,102, issued Nov. 11, 1969.

The invention relates to catamenial tampons of the type comprising a rolled pad of wadding, such as cotton wool, provided with a draw thread for removal purposes.

Draw threads are apt to complicate the process of rolling the pad of wadding and to be a hindrance in the subsequent packing and marketing of the articles.

An object of the invention is to provide an improved method of and apparatus for assembling tampons of the type above referred to and, in particular, for manipulating and interengaging the draw thread and the wadding pad in the operation of rolling up the latter resulting in a final formation of the free end of the draw thread such that it lies within the overall external dimensions of the rolled pad, presents a neat appearance and can be located without difficulty by the user.

The method according to the invention for the production of a tampon by rolling up a wadding pad upon a rotating mandrel comprises forming a knotted loop of draw thread slung with clearance around said wadding pad with the thread ends lying across the width of the pad, and whilst rolling up the pad by rotation of the mandrel, forming an annular recess within that end of the rolled pad adjacent the free ends of the draw thread and simultaneously spirally winding the free ends of the draw thread into a flat spool seated in said annular recess.

More particularly the method comprises forming a knotted loop of draw thread slung with clearance around said wadding pad with the thread ends lying across the width of the pad, axially displacing a hollow sleeve with respect to the mandrel whilst rotating the latter to roll up the wadding pad, thereby forming an annular recess within that end of the rolled pad adjacent the free ends of the draw thread and simultaneously spirally winding the free ends of the draw thread into a flat spool seated in said annular recess.

The apparatus according to the invention for the production of a tampon by rolling up a wadding pad upon a rotatory mandrel may comprise means for forming a knotted loop of draw thread and slinging it with clearance around the wadding pad before the latter is rolled up on the mandrel, a hollow sleeve mounted for coaxial movement over the mandrel but non-rotatable with respect to the mandrel, means for axially reciprocating said hollow sleeve, thread guiding means carried by the mandrel and a thread guide means carried by the coaxial hollow sleeve, said thread guiding means carried by the hollow sleeve being shaped shaped to intercept and direct the free ends of the draw thread internally and axially of said hollow sleeve while the mandrel is rotated and while the hollow sleeve is displaced axially by the reciprocating means into one end of the pad being rolled up, whereby the draw thread is wound into a flat spiral spool seated in an annular recess formed by said hollow sleeve in the end of the rolled up pad.

For engagement with the wadding pad, the mandrel is slotted to engage both sides of the pad. The reciprocatable but non-rotatable hollow sleeve serves both for sliding the rolled up pad off the mandrel when completed and for forming, in conjunction with the mandrel, the flat spirally wound spool of draw thread.

The free end of the hollow sleeve facing the pad of wadding has on its frontal side an annular collar, bounded radially outward by a shoulder, into which a guide cam for the draw thread is tangentially directed. The cam is directed against the winding mandrel's direction of rotation, is arcuately shaped and extends away from the free end of the mandrel whilst maintaining a constant distance from the mandrel's longitudinal axis.

To reduce to a minimum the space taken up by the hollow sleeve in its axial displacement against the end of the wadding pad and simultaneously to facilitate pressing the sleeve against the pad, provision is made according to a further feature of the invention for the winding capsule to taper conically towards its free end.

The width of the guide cam for winding the draw thread is designed to be smaller than that of the annular shoulder in such a way that the annular shoulder radially bounds the guide cam on the inside. This ensures perfect hygienic conditions while guiding the draw thread to be wound up.

Advantageously, provision is made for the guide cam to extend over a circumferential angle of about 90° of the hollow sleeve and to extend towards the end remote from the free end of the mandrel and, with the annular collar, to merge into a common surface more or less horizontal and parallel with the sleeve's longitudinal axis. In this arrangement, the end of the sleeve facing the winding mandrel is provided with a slotted slide ring which is releasably secured to the sleeve.

According to a further feature of the invention, the reciprocating motion of the sleeve is derived from a cam actuated by a motor against a restoring force and the motor also actuates in timed relation a further cam for the axial reciprocating motion of the winding mandrel.

According to a further feature of the invention the motor drives through an intermediate gear a further cam in addition to the two cams for the sleeve and the winding mandrel, and rotary motion of the mandrel is obtained from the further cam by a lever, one arm of which is actuated by the cam and the other arm of which is linked to a rack which meshes with a splined bush on the driving shaft of the winding mandrel.

Preferably use is made of a winding mandrel having a longitudinal slot, the length of which is slightly less than the width of the wadding pad and the opening of the slot slightly larger than the thickness of the wadding pad, and the fork constituted by the slot in the mandrel is provided at the front ends with two notches for the thread set transversely to the mandrel axis.

These notches are situated within the range of movement of a thread transfer device, which, independence on the traction exerted on the loop of thread by a knotting device against a restoring force, passes the knotted loop of the draw thread encircling the wadding pad on to the notches in the winding mandrel. This makes it possible so to combine the device for looping the thread over the wadding pad and for knotting the loop's ends with the apparatus for rolling up the wadding pad and winding the draw thread as to ensure continuous production of the finished tampons.

As an extension of this feature of the invention, the thread transfer device is fork-shaped, with its end so

spaced apart in relation to the external diameter of a rotating spiral thread driven by a wheel, that, on each occasion, the thread loop is transferred to the thread transfer device from the guide, is knotted and is held by the transfer device against spring action in the position for taking up of the loop by the mandrel.

According to a further feature the ends of the fork-shaped thread transfer device extend over the frontal surface of the spiral thread guide so that, under all operational conditions, the loop will be safely taken up by the transfer device when the knotted loop has been made.

The thread transfer device can advantageously be arranged to pivot on an axis parallel with the rotational plane of the wheel which rotates the spiral thread guide.

A further feature of the invention consists in a design of the spiral thread guide so that it merges at the front into a nose extending tangentially beyond the circumference, and which, when the spiral guide is rotated can move within a small distance of the ends of the thread transfer device serving for the uptake of the loop. The nose on the front of the spiral guide thus contributes to the safe transfer of the loop to the thread transfer device.

The method and apparatus will now be described in more detail with reference to an example illustrated in the accompanying diagrammatic drawings, wherein:

FIG. 1 is an apparatus for winding and pressing in the draw thread.

FIG. 2 is a side view of FIG. 1 along the section line II—II.

FIG. 3 is a larger scale view of a sleeve shown in FIG. 1.

FIG. 4 is a front view of the sleeve as in FIG. 3.

FIG. 5 is a longitudinal section along the line V—V in FIG. 3.

FIG. 6 is a transverse section along the line VI—VI in FIG. 5.

FIG. 7 is a partial representation of the apparatus according to FIG. 1 before the transfer of the knotted loop on to the winding mandrel.

FIG. 8 is a frontal view of FIG. 7.

FIG. 9 is a side view of FIG. 7.

FIG. 10 shows the apparatus as in FIG. 7 with the loop of the draw thread passed onto the winding mandrel.

FIG. 11 is a frontal view of FIG. 10.

FIG. 12 is a representation according to FIG. 7 and FIG. 10 as the draw thread is being wound into a spool.

FIG. 13 is a frontal view of FIG. 12.

FIG. 14 is a cotton wool pad with a knotted loop of the draw thread passed thereover.

FIG. 15 shows the rolled up cotton wool with the protruding knotted end of the loop of the draw thread.

FIG. 16 shows the draw thread wound into a spool and pressed against the frontal end of the cotton wool roll.

FIG. 17 is a longitudinal section through the tampon as in FIG. 16.

The drawings illustrate an apparatus for curling up the free end of a draw thread 1 and pressing it into one end of a wadding roll 2 of the kind used as menstruation tampons, this pressing operation being performed by means of a slide which, for the purpose of removing the finished roll from a winding mandrel 3, can be moved parallel to said winding mandrel engaging the wadding roll.

According to the invention, the slide takes the form of a sleeve 5, which can be displaced coaxially upon the winding mandrel 3 but is non-rotatable. The free end of the sleeve facing towards the length of wadding fleece 4 possesses a frontal annular collar 6 (FIGS. 3 to 6), which bounds radially outward an internal annular shoulder 7.

A guide cam 8 for the draw thread merges tangentially (at 9) into the plane of the annular shoulder, which cam is directed against the rotation sense of the winding mandrel as shown by the arrow *x* and extends, arcuately shaped (at 10) towards that end remote from the winding mandrel whilst remaining at a constant distance from the long axis of the winding mandrel. Externally the sleeve 5 is conically tapered at 11 towards its free end.

The width of the guide cam 8 is designed to be smaller than that of the annular shoulder 7 and specifically in such a way that the annular shoulder bounds the guide cam radially inward at 12. The guide cam 8 extends over a circumferential angle of about 90° of the sleeve and merges at the end remote from the winding mandrel, together with the annular collar 6, into a common surface 13 more or less horizontal and parallel with the sleeve longitudinal axis. The sleeve takes the form of a core tube (FIG. 5), on the end of which facing the free end of the winding mandrel a slotted pusher ring 15 is releasably attached by a screw 16. At that end of the core tube remote from the ring 15 is mounted a non-rotatable bush 17 provided with diametrally opposite studs 18*a*, 18*b*. The studs engage in slots 19 (FIG. 1) of a forked driver 20 secured to one end of a push rod 21, which is mounted for longitudinal displacement parallel to the longitudinal axis of the winding mandrel 3 in a part of the machine 22 shown partly broken away. Two tension springs, 23*a*, 23*b* engage with one end a cross head 24 mounted transversely upon the push rod and have their other ends connected to a fixed point 25*a*, 25*b* of the machine, and the push rod 21, with a rotatable roller 26 secured to its end remote from the fork-shaped driver 20, bears continuously upon a cam disc 27.

The cam disc 27 is coupled by an endless flexible component 28 with a shaft 29, which, through a further endless flexible component 30 is actuated by a drive motor 31.

Upon the shaft 29 is mounted a further cam disc 32, which operates in conjunction with a roller 33 at one end of a double lever 34. The double lever 34 is pivoted about an axis 35 and, by means of tension spring 36, which engages its other lever arm, has its roller 33 continuously pressed against the cam disc 32. The end of the double lever remote from the roller possesses a block 37, engaged by a pin attached to a block 39. The block 39 can be longitudinally displaced but is secured against rotation and coupled to a driving shaft 40 carrying the winding mandrel 3 at the opposite end so that it cannot be displaced axially with respect to said shaft 40 but allows the shaft to rotate. Thus is ensured a synchronous drive for the cam discs 27 and 32 and derived from them is an accurately determined axial movement of the push rod 23 and of the winding mandrel 3.

Non-rotatably attached to the driving shaft 40 of the winding mandrel 3 is a splined sleeve 41, engaged by a rack 42 which can be vertically reciprocated. The

lower end of the rack is attached to a link lever **43**, the lower end of which is articulatedly connected to a double lever **44**. The double lever is pivotally mounted upon an axis **45**. The end of the double lever **44** remote from the attachment point **46** for the link lever **43** is fitted with a roller **47**, which, under the action of a tension spring **48**, continuously makes contact with a cam disc **49**. The cam disc **49** is coupled by a suitable gearing **50** to a shaft **51**, which is itself coupled by a bevel gear **52** to the driving shaft of motor **31**. It is quite clear that in this way cam disc **49**, also, performs an accurately determined movement with relation to the axial reciprocating motions of the push rod **21** for the sleeve and of the driving shaft **40** for the winding mandrel **3** and ensures the clockwise and counter-clockwise rotation of the driving shaft **40** for the winding mandrel **3** corresponding to the reciprocating motion of the rack **42**.

FIGS. **7** and **9** show that the winding mandrel **3** possesses a longitudinal slot **53**, the length of which is designed to be slightly less than the width of the wadding pad **4** to be rolled up, and the gauge of the slot larger than the thickness of the pad **4**. The fork prongs **54***a*, **54***b* formed by the slot are provided at their front ends with two notched **55** set transversely to the winding mandrel axis (FIG. **7**) and lying, prior to the rolling of the pad, in the region of its outer longitudinal edges. The notches **55** on the free frontal side of the winding mandrel **3** are situated within the range of thread transfer device **56**, which, in dependence upon the tractive force which a knotting device **57** exerts on the loop of the draw thread **1** against the effect of a resetting spring **58** (FIGS. **7** and **8**), passes the loop onto the notches in the winding mandrel. The fork prongs **54***a*, **54***b* have a slightly smaller spacing from each other than the external diameter of a spiral guide **59**. The spiral guide **59** is associated with a revolving wheel **60** for an endless flexible component **61** that, on each occasion, runs the draw thread **1** around the wadding pad **4** and is also associated with the knotting device **57**.

The draw thread transfer device **56** is normally held by the spring resetting device **58** in the position illustrated by the full lines in FIG. **10** for receiving the loop of the draw thread **1** (FIGS. **12** and **13**). The transfer position of the thread transfer device can be seen from the dotted line position in FIG. **10**. The ends of the fork **56***a*, **56***b* cover, with a small clearance, the end face of the spiral guide **59** by means of a part which runs to a point from transfer shoulders **56***c* for the loop, which clearance is nevertheless sufficient to ensure the transfer of the loop of the draw thread **1** from the spiral guide onto the transfer shoulders **56***c*, onto which the thread loop arrives by the effect of the traction exerted on it by the knotting device. In the course of the pivoting of the thread transfer device the thread loop becomes forced more strongly against the above mentioned ends **56***a*, **56***b* of the device, as FIG. **7** clearly shows. The end of the transfer device remote from the ends of the fork is arranged to pivot on an axis **62** parallel with the plane of rotation of the travelling component **61**. The spiral track of the guide merges in the direction of its frontal side into a nose **59***a* extending somewhat tangentially beyond the spiral's circumference. When the spiral guide is rotated this nose moves with only a small clearance past the ends **56***a*, **56***b* of the transfer fork serving to take up the loop of the draw thread **1**. FIGS. **12** and **13** clearly show that in this operation the nose and the ends of the thread transfer device overlap in such a way as to ensure that the loop of the draw thread **1** can slide over the guide nose **59***a* onto the transfer device.

As shown in FIG. **8**, the knotting device also comprises another guide wheel **63** for the endless flexible component **61**, with which is connected a controllable thread puller **64**. The guide wheel **63** is connected to a knotting hook, which is not illustrated, and which cooperates with a thread guide cam **65**. A control lever **66** serves to shut off the machine when a loop is not knotted. A supply spool for the thread is shown as **67**. The knotting device is not part of the present invention.

The apparatus described operates according to the invention as follows:

When the knotted loop of the draw thread **1**, encircling with clearance the length of wadding to be rolled up, has been transferred into the end face notches **55** of the winding mandrel **3** which embraces the wadding fleece at both sides, the sleeve **5**, which can be displaced only axially, is displaced by a multiple of the axial distance between the end surface of the annular collar **6** and the internal annular shoulder **7** in the direction of the wadding fleece **4**. The doubled, knotted end of the thread **1** is then drawn by the subsequent rotation of the winding mandrel **3** into the annular space bounded by the annular collar **6**, the winding mandrel **3**, the roll of wadding **2** and the annular projection **7** thus forming a spiral-shaped spool of thread and, specifically, in such a way that the spool lies within the roll of wadding and is substantially flush with its outside surfaces. On completion of the winding mandrel's rotation, the wadding roll **2** is pushed by the action of the sleeve **5** over the free end of the winding mandrel with the result that the spool of thread **68**, because of the greater friction between the wadding and the thread material, remains attached to the roll when the sleeve is later drawn away from the ejected wadding roll **2**.

The apparatus above described achieves the advantageous working cycle wherein after the draw thread loop encircling the wadding pad with clearance has been transferred to the winding mandrel, the pad is rolled up whilst the projecting end of the draw thread is synchronously wound into a spool and pressed against the end of the roll, this being done in timed relation with the knotting operation so that a further knotted loop is prepared ready to be thrown around the next wadding pad whilst the preceding pad is being rolled up.

The arrangement of the annular collar on the end surface of the winding mandrel adjacent the wadding pad, in combination with the internal annular shoulder and the associated cam ensures that the draw thread will be evenly wound and pressed against the frontal side of the cotton wool pad with the high reliability required by mass production. This arrangement of the thread has various advantages. Firstly, when the pad is later compressed and packed in the finished condition, the draw thread can neither be damaged nor interfere with the smooth flow of production. Secondly, the arrangement simplifies the actual handling of the tampon by the user, since the end of the draw thread can be located with ease and certainty even in the dark, so that use of the tampon can be begun without the time-consuming manipulations which may be involved in the undesirable loosening of the tampon wadding. Finally, an advantage is that the arrangement favours the use of

a clearly visible coloured draw thread, which was not previously possible for reasons of presentation, because a coloured draw thread projecting from the front end of the tampon could impair its appearance.

I claim:

1. Apparatus for the production of a tampon by rolling up a wadding pad upon a rotary mandrel comprising means for slinging a draw thread with clearance around a wadding pad positioned on a rotary mandrel and means for forming a knotted loop having a free end from said draw thread before the wadding pad is rolled up on the mandrel, means for rotating said mandrel, a sleeve mounted for coaxial movement about the mandrel but non-rotatable with respect to the mandrel, means for axially reciprocating said sleeve, a first thread guide means carried by said mandrel and a second thread guide means carried by the coaxial sleeve, said first guide means for guiding the thread as it is slung around said mandrel and said wadding, said second thread guiding means carried by the sleeve having means to intercept and direct the free end of the draw thread internally of said sleeve while the mandrel is rotated and while the sleeve is displaced axially by the reciprocating means into one end of the pad being rolled up, whereby the draw thread is wound into a flat spiral spool seated in recess annular recessed formed by said displacement of said sleeve into the end of the rolled up pad.

2. Apparatus according to claim **1,** wherein said sleeve has an end facing the pad of said wadding and includes an annular collar bounded radially outward by a shoulder, a guide cam for the draw thread tangentially abutting said shoulder.

3. Apparatus according to claim **2,** wherein the sleeve tapers conically towards its free end surrounding the mandrel.

4. Apparatus according to claim **2,** wherein the width of the guide cam located in the sleeve for winding the draw thread is smaller than that of the annular shoulder so that said annular shoulder radially bounds the guide cam on the inside.

5. Apparatus according to claim **2,** wherein the guide cam extends over a circumferential angle of about 90° of the sleeve and with the annular collar, merge into a common surface extending substantially horizontal and parallel with the longitudinal axis towards the end remote from the mandrel.

6. Apparatus according to claim **2,** wherein the end of the sleeve facing the winding mandrel includes a slotted pusher ring releasably secured to the sleeve.

7. Apparatus according to claim **1,** which further comprises means for reciprocating said mandrel, a common driving means for driving said respective reciprocating means in timed relation.

8. Apparatus according to claim **7** wherein said winding mandrel comprises a shaft carrying a gear sleeve, a rack gear engaging said gear sleeve, a double armed lever, one arm of which engages a link lever, said link lever connected to said rack gear, the other arm of said double armed lever connected to a roller, means for rocking said double armed lever including cam means engaging said roller.

9. Apparatus according to claim **1,** wherein the winding mandrel comprises a fork having a longitudinal slot embracing each side of the wadding pad, the length of which slot is slightly less than the width of the wadding pad and the opening of the slot slightly larger than the thickness of the wadding pad, said thread guide means of said winding mandrel comprising two notches on the front end of said fork, which notches are aligned transversely to the mandrel axis.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,852,847 Dated December 10,1974

Inventor(s) Herbert Etz

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In Column 1, line 56, delete first occurrence of "shaped".

In Column 3, line 2, "spiral thread driven" should read --- spiral thread guide driven ---.

In Column 5, line 25, "notched 55" should read --- notches 55 ---.

In Column 7, Claim 1, line 26, "seated in recess annular recessed formed" should read --- seated in an annular recess formed ---.

Signed and sealed this 17th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks