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(54) APPARATUS FOR THE PRODUCTION OF REELS OF EXTENDABLE FILM PRESTRETCHED LONGITUDINALLY

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(57) **ABSTRACT**

Apparatus for the production of reels of extendable film prestretched longitudinally and of varying weight, from normal reels of extendable film, characterized in that it comprises a container (**1**) closed by a cover (**3**) inside which means for rotatably supporting a reel (B) supplying the extendable film as well as parallel prestretching rollers (**8, 108**) and a spindle (**15**) for storing the prestretched film are arranged, these means being all operated by a centralized drive unit (**7**) and means being envisaged for programming the operation of the apparatus, for the production of reels of prestretched film with the weight required in each case.

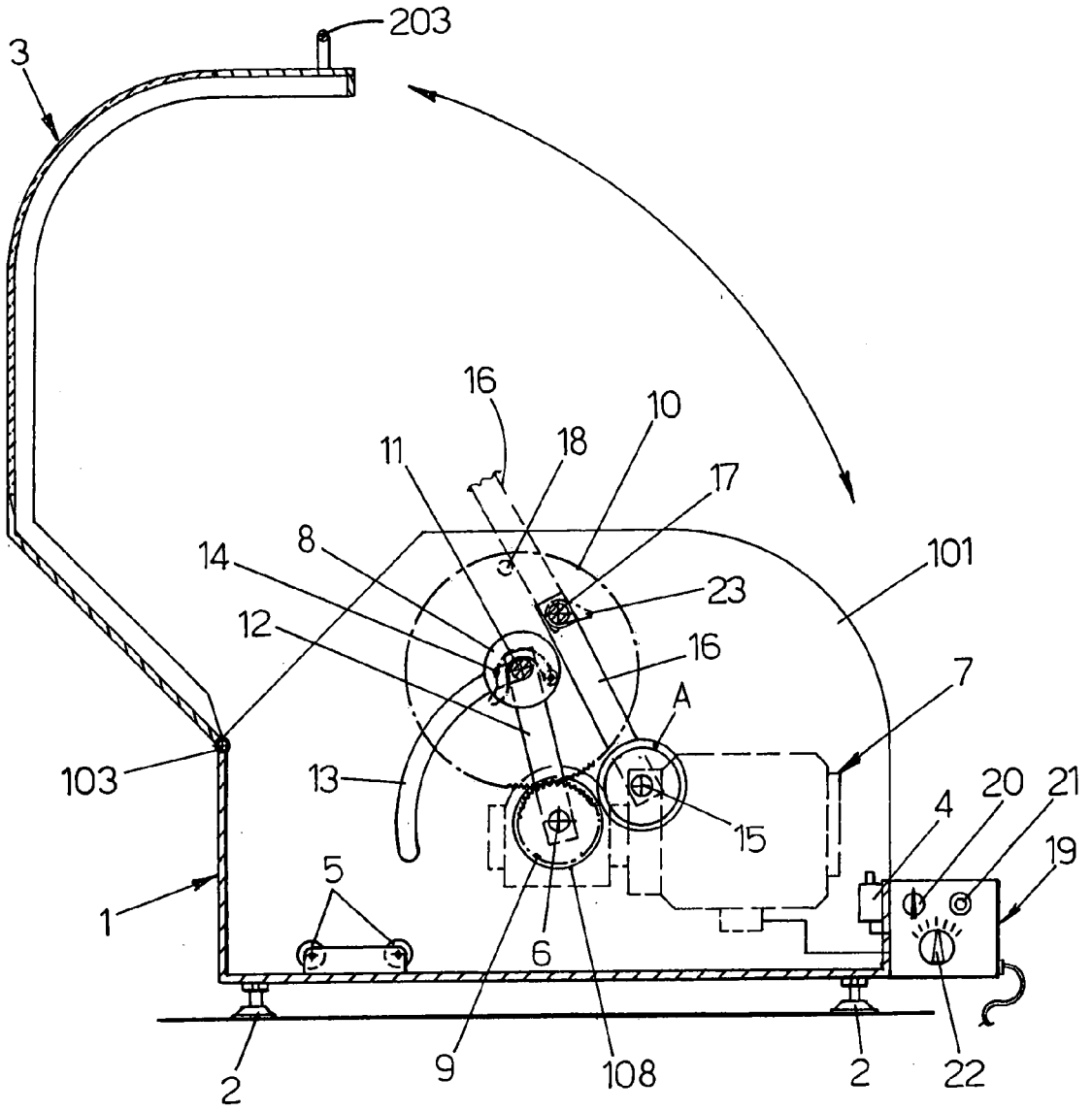
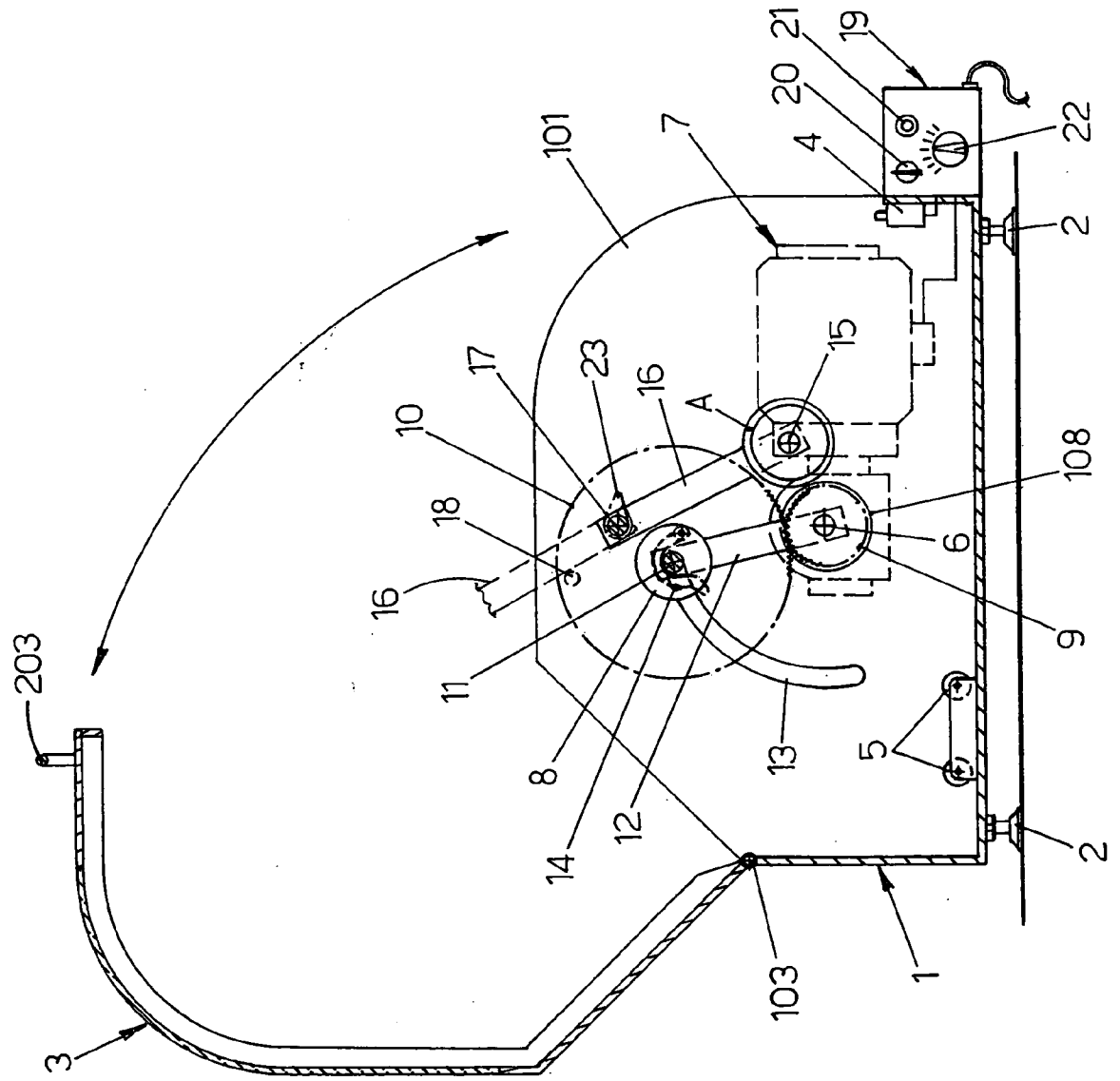


Fig.1


203
3
101
7
21
19
20
22
4
2
17
23
16
A
15
10
108
18
6
16
9
11
13
5
8
14
12
2
103
1

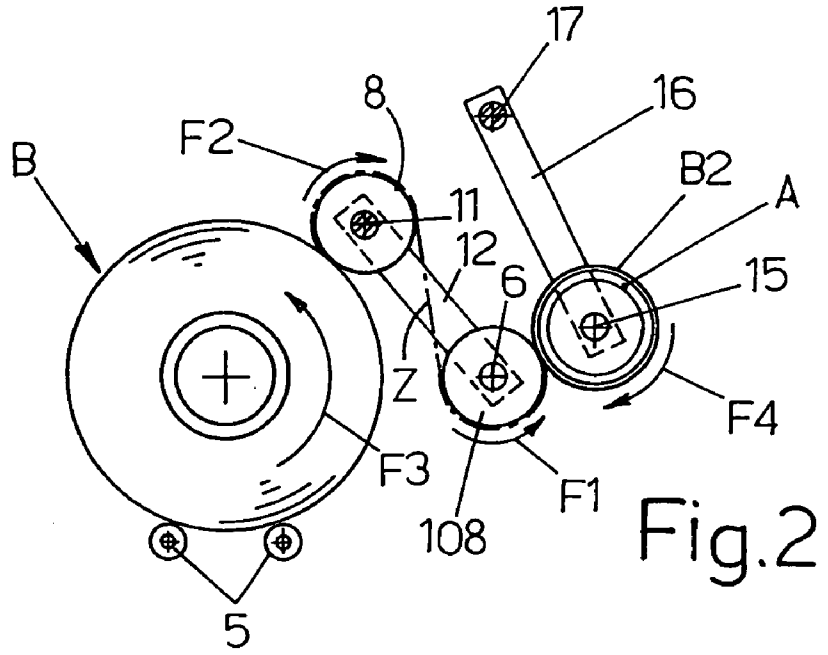

17
16
8
F2
B
B2
A
11
12
6
15
Z
F4
F3
F1
108
5

Fig.2

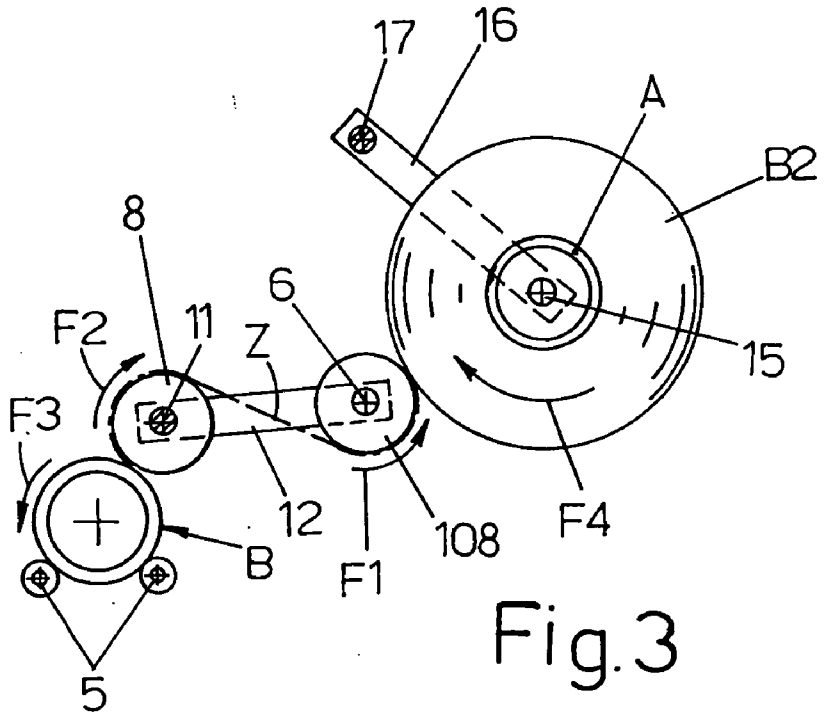

17
16
A
B2
8
6
F2
11
Z
15
F3
12
108
F4
B
F1
5

Fig.3

APPARATUS FOR THE PRODUCTION OF REELS OF EXTENDABLE FILM PRESTRETCHED LONGITUDINALLY

[0001] In order to wrap palletized loads using manually operated dispensers or using small apparatus or machines which may not have their own longitudinal prestretching means, at present it is required to use reels of extendable film prestretched longitudinally and of varying length and hence varying weight, which are difficult to find on the market and are therefore costly. At present there is the tendency to use prestretched film also in wrapping machines which have their own prestretching means since it has been shown that if an extendable film is prestretched with a first longitudinal prestretching operation and is left to rest on the reel for a sufficient period of time, an elastic memory return effect is activated in the film sufficient to ensure that the said film may undergo during use a subsequent longitudinal prestretching operation, or so-called "restretching" operation, so as to be able to withstand elongation greater than that which is usual, with all the economic advantages arising from this condition.

[0002] The invention relates to an apparatus which is easy to manufacture and low-cost and is therefore also within the price range of small and medium-size firms, said apparatus allowing the production of reels of extendable film prestretched longitudinally and of any weight, using a conventional reel of extendable film which is not difficult to procure, which has a large degree of autonomy and which has a cost which is overall much less than that of the reels of prestretched extendable film which can be obtained from it and are otherwise acquired already ready for use. The apparatus comprises a container with a cover which is entirely or partly transparent, inside which the means for rotatably supporting the reel of extendable film as well as the prestretching rollers and the spindle for storing the prestretched film are arranged, these means being all operated by a centralized drive unit. Easy means are envisaged for programming the apparatus for the production of reels of prestretched film with the capacity and with the weight required in each case.

[0003] Further characteristic features of the invention and the advantages arising therefrom will emerge more clearly from the following description of a preferred embodiment thereof, illustrated purely by way of a non-limiting example, in the figures of the accompanying illustrative plate in which:

[0004] **FIG. 1** is a side elevation view of the apparatus cross-sectioned along a vertical plane and in the rest position;

[0005] **FIGS. 2 and 3** show laterally the sole internal operating components of the apparatus, at the start and at the end of the cycle for production of a reel of prestretched extendable film.

[0006] From **FIG. 1** it can be seen that the apparatus comprises a container **1** which is made entirely of metal or with a metal frame and with cushioning elements made of any material, which rests on the ground with anti-vibration feet **2**, which is open upwards and is closed by a cover **3** which is preferably made at least partly of transparent material, which is hinged for example at **103** on one end of the said container **1** and is provided at the other end with a gripping handle **203** for raising and lowering. If necessary, the hinging pivot **103** may be designed so that the cover **3** may be easily removed in order to facilitate the apparatus loading operations and any maintenance operations. When, on the other hand, the cover **3** is in the position for closing the container **1**, it is envisaged that the said cover activates a safety microswitch **4** which automatically stops the operation of the apparatus if the said cover is raised during a working cycle of the said apparatus in question.

[0007] The container **1** is provided internally with means for rotatably supporting about its horizontal axis the reel B supplying the extendable film, these means consisting for example of a pair of parallel and idle rollers **5** which are positioned on the bottom of the container **1** and parallel to the said hinging pivot **103** and on which the said reel of film B is rested along its generatrix, as shown in **FIG. 2**. Special means, not shown, are envisaged for facilitating positioning, on the idle rollers **5** inside the container **1**, of the reel B which may have a considerable weight. It is understood that, in place of the rollers **5**, it is possible to envisage other means of the known type for supporting the reel of film B rotatable about its horizontal axis, for example means equipped with bearing-type supports for supporting the ends of a spindle which is mounted axially inside the said reel B and these means may be of the sliding or pivoting type, so that they may be positioned, not only inside the container **1**, but also on the outside thereof, for easy loading of the reel B. The container **1** has dimensions such that it is able to accommodate internally reels B for example with a diameter of 250-450 mm. Purely by way of a non-limiting example, the container **1** may have the following dimensions: width about 800-1000 mm, height about 500 mm, depth about 700 mm.

[0008] Parallel to the rollers **5**, the sidewalls **101** of the container **1** rotatably support a shaft **6** which is keyed to the slow output of a gearmotor **7** which may be bracket-mounted on the outside of a said sidewall **101** and on which a rubber-coated roller **108** is keyed and which has, keyed on one end, a small-diameter gearwheel **9** which meshes with a larger-diameter gearwheel **10** keyed onto the end of a rubber-coated roller **8** parallel to the roller **108** and rotatably supported by a torque shaft **11** which connects together a pair of parallel arms **12** mounted with the possibility of freely pivoting on the said shaft **6**. The gearwheels **9** and **10** may be arranged inside a special casing or inside a lateral cavity of the container **1** so that they are protected and may be lubricated with suitable means and so that, if necessary, they may be replaced if it is required to modify the relative rotational ratio of the rubber-coated rollers **8** and **108**. By means of the action of the gearmotor **7**, the rubber-coated roller **108** rotates in the direction F**1** opposite to the direction F**2** of rotation of the rubber-coated roller **8** and at a higher speed which is determined by the ratio between the diameters of the gearwheels **9** and **10**. Owing to the weight of the rubber-coated roller **8** and the direction of rotation F**1**, F**2** and since the arms **12** are preferably unable to go beyond the vertical position, the said rubber-coated roller **8** rests tangentially by means of gravity on the reel B of film positioned on the support rollers **5** and also causes rotation of this reel about its axis, in the direction F**3** and with the speed necessary for unwinding from the latter the film Z which is conveyed around the top half of the rubber-coated roller **8** and then around the bottom half of the rubber-coated roller

108, so that when passing from one roller to the other roller, the said film undergoes the desired longitudinal prestretching action.

[**0009**] Special means are envisaged for keeping the roller **8** temporarily in the raised position when it is required to position a new reel B of film on the support rollers **5**. These means may, for example, envisage that the torque shaft **11** projects with one end from a sidewall **101** of the container **1**, through a curved slit **13** provided on this sidewall and having its centre of curvature on the drive shaft **6** and this same projecting end of the shaft **11** may be easily kept in the raised position as shown in **FIG. 1**, by means of a simple latch **14** mounted externally on the said sidewall **101** which has the eyelet **13**. After mounting the reel B on the rollers **5**, the latch **14** is raised so as to free the pivoting structure **11**, **12** so that the rubber-coated roller **8** comes into contact with the said reel B, as shown in **FIG. 2**. It can be easily understood how, from the position of the shaft **11** inside the eyelet **13**, it is possible to determine from outside the container **1** the state of the supply reel B.

[**0010**] The end of the prestretched film Z which leaves the faster rubber-coated roller **108** is fixed onto a tubular core A—for example made of cardboard—which is supplied in a suitable quantity with the apparatus in question. The core A is keyed onto a spindle **15** which with its ends is removably supported by a pair of parallel pivoting arms **16** keyed onto a torque shaft **17** which is supported rotatably by the sidewalls **101** of the container **1**, all of which being arranged so that the said core A tends to remain in contact by means of gravity with the rubber-coated roller **108**. This contact condition, which is particularly useful during the initial stage of the cycle when the core A is empty and light, may be ensured by a special ballast weight incorporated in or associated with the spindle **15** or with the use of special resilient means, not shown in that they may be easily deduced by persons skilled in the art. As a result of this contact between the core A and the roller **108**, the said core A is made to rotate in the direction F**4** and with the speed necessary to take up the prestretched film leaving the said roller **108**.

[**0011**] In order to facilitate the positioning and removal of the spindle **15** onto and from the arms **16**, it is possible to envisage usefully the possibility of pivoting these arms upwards so as to bring them into a rest condition against a stop **18** integral with the inner side of at least one of the sidewalls **101** of the container **1**, as indicated in **FIG. 1** by means of broken lines. Special damping means, not shown, may be envisaged to brake the downwards pivoting of the arms **16**.

[**0012**] From a comparison of **FIGS. 2 and 3**, it can be understood how, by means of the rotation created by the centralized drive unit **7** in **FIG. 1**, it is possible to achieve the rotation F**3** of the film supply reel B, the rotation F**1**, F**2** at different speeds of the prestretching rollers **8**, **108** and the rotation F**4** of the cardboard core A on which the prestretched film is stored. In **FIG. 2** the apparatus is shown at the start of a cycle, with the supply reel B full and with the cardboard core A substantially empty, while in **FIG. 3** the apparatus is shown at the end of a hypothetical working cycle where all the film supplied by the reel B, which is now empty, has been prestretched and stored in the form of a reel B**2** on the cardboard core A. In order to remove the reel B**2** of prestretched film, the cover **3** is opened, the film Z is cut along an accessible section, for example along the section situated between the rollers **8**, **108** and then the pivoting structure **16** is rotated upwards, against the stop **18**, in order to remove the spindle **15** with the associated reel B**2**, following which the said spindle **15** may be fitted with a new cardboard core and may be repositioned on the arms **16** for the repetition of a new working cycle.

[**0013**] With the apparatus it is possible to produce reels of prestretched film of any desired weight, these involving partial unwinding of extendable film from the supply reel B. For this purpose, the apparatus has, associated therewith in any suitable position also different from that shown in **FIG. 1**, a small electric control panel **19** which comprises, for example, an activation control device **20**, a stop control device **21** and a timer **22** by means of which it is possible to select the activity time of the apparatus and consequently the quantity of prestretched film stored on the reel A. The rotating selector of the timer **22** may show, around it, the weight in kilograms of the film which may be stored on the tubular core A. Special signalling means, not shown, may be envisaged to indicate when the apparatus has produced the reel of prestretched film of predefined weight, after the timer **22** has stopped the gearmotor **7**. A pointer **23** may be fixed onto one end of the torque shaft **17**, projecting from a sidewall **101** of the container **1**, said pointer moving along a graduated scale provided on the outer side of the said sidewall, in order to indicate the weight or the diameter of the reel B**2** of prestretched film stored on the core A.

[**0014**] It is understood that the description refers to a preferred embodiment of the invention, with the omission of the constructional details relating to the arrangement of the gearmotor **7** and the gearwheels **9**, **10**, since they may be easily deduced and easily realized by persons skilled in the art. It is also understood that the invention as described may be subject to numerous constructional variations and modifications which may refer to the use of means different from the gearwheels **9**, **10** for transmitting the different relative rotational ratio of the prestretching rollers **8**, **108**. Other modifications may relate to the container **1** and to the cover **3**, so as to provide the former only with functions of a frame for supporting the various components described, so that it is very open on the sides, and so as to provide the latter also with functions of a container. In other words, the cover **3** could be designed as a kind of bell, raising of which would provide better access to the various components of the apparatus, both in order to facilitate arrangement in position of a new reel B, and for removal of the reel B**2** of prestretched film produced in each case.

1) Apparatus for the production of reels of extendable film prestretched longitudinally and of varying weight, from normal reels of extendable film, characterized in that it comprises a frame or container (**1**) closed by a cover (**3**) inside which means for rotatably supporting a reel (B) supplying the extendable film as well as parallel prestretching rollers (**8**, **108**) and a spindle (**15**) for storing the prestretched film are arranged, these means being all operated by a centralized drive unit (**7**) and means being envisaged for programming the operation of the apparatus, for the production of reels of prestretched film with the weight required in each case.

2) Apparatus according to claim 1), in which the container (**1**) rests on the ground with special feet (**2**), is open upwards

and is closed by a cover (**3**) wholly or partly made of transparent material for allowing viewing of the components inside the said container, this cover being hinged on one end (**103**) of the said container (**1**) and being provided at the other end with a gripping handle (**203**) for raising and lowering.

3) Apparatus according to claim 2), characterized in that when the cover (**3**) is in the position for closing the container (**1**), it is envisaged that it activates a safety microswitch (**4**) which automatically stops operation of the apparatus if the said cover is raised during a working cycle of the said apparatus in question.

4) Apparatus according to claim 1), in which the means for rotatably supporting about its horizontal axis the reel (B) supplying the extendable film consist for example of a pair of parallel and idle rollers (**5**) which are positioned transversely on the bottom of the container (**1**) and on which the said reel of film (B) is rested along its generatrix.

5) Apparatus according to claim 1), in which the means for rotatably supporting about its horizontal axis the reel (B) supplying the extendable film are equipped, for example, with bearing-type supports for supporting the ends of a spindle which is mounted axially inside the said reel (B).

6) Apparatus according to claim 1), in which, parallel to the axis of the reel (B) supplying the extendable film, the sidewalls (**101**) of the frame or container (**1**) rotatably support a shaft (**6**) which is keyed to the slow output of a gearmotor (**7**) which is bracket-mounted on the outside of a said sidewall (**101**), a rubber-coated roller (**108**) being keyed onto this shaft, and which has keyed, on one end, a small-diameter gearwheel (**9**) which meshes with a larger-diameter gearwheel (**10**) keyed onto the end of a rubber-coated roller (**8**) parallel to the preceding rubber-coated roller (**108**), positioned above the latter and rotatably supported by a shaft (**11**) which connects together a pair of parallel arms (**12**) mounted with the possibility of pivoting on the said drive shaft (**6**), it being envisaged that the film (Z) unwound from the supply reel (B) is conveyed around the top half of the slow rubber-coated roller (**8**) and then around the bottom half of the fast rubber-coated roller (**108**) so that, when passing from one roller to the other roller, the said film undergoes the desired longitudinal prestretching.

7) Apparatus according to claim 6), in which the gearwheels (**9**, **10**) may be arranged inside a special associated casing or inside a lateral cavity of the container (**1**) so as to be protected, lubricated if necessary with suitable means and replaced if necessary if it is required to modify the relative rotational ratio of the rubber-coated prestretching rollers (**8**, **108**).

8) Apparatus according to claim 6), in which as a result of the weight of the slow upper rubber-coated roller (**8**) and since the arms (**12**) which support this roller are preferably unable to go beyond the vertical position, the said rubber-coated roller (**8**) cooperates by means of gravity and tangentially with the reel (B) supplying the extendable film, so as to cause it to rotate about its axis at the appropriate speed and in the appropriate direction for supplying the film to the prestretching rollers.

9) Apparatus according to claim 6), in which special means are envisaged for keeping the slow upper prestretching roller (**8**) temporarily in the raised position when it is required to position a new reel (B) of film on the special support means (**5**).

10) Apparatus according to claim 9), in which the torque shaft (**11**) which rotatably supports the slow prestretching roller (**8**) projects with one end from a sidewall (**101**) of the container (**1**), for example through a curved slit (**13**) provided in this sidewall and having a centre of curvature about the drive shaft (**6**), and it being envisaged that this same projecting end of the said shaft (**11**) may be retained in the raised position by means of a latch (**14**) mounted externally on the said sidewall (**101**) which has the said eyelet (**13**).

11) Apparatus according to claim 6), in which the end of the prestretched film (Z) which leaves the fast prestretching roller (**108**) is fixed onto a tubular core (A) keyed onto a spindle (**15**) which with its ends is removably supported by a pair of pivoting parallel arms (**16**) keyed onto a torque shaft (**17**) rotatably supported by the sidewalls (**101**) of the container (**1**), all of which being arranged so that the said tubular core (A) tends to remain in contact with the said fast prestretching roller (**108**) by means of gravity so as to be rotationally driven by the latter, it being envisaged that this contact condition, which is particularly useful during the initial stage of the cycle when the said core (A) is empty and light, is ensured by special ballast weights which are intrinsic or associated with the spindle (**15**) and/or by special resilient means.

12) Apparatus according to claim 11), in which, in order to facilitate positioning and removal of the spindle (**15**) onto and from the associated pivoting support arms (**16**), it is possible to envisage the possibility of pivoting these arms upwards and causing them to rest against a stop (**18**) which is integral with at least one of the sidewalls (**101**) of the container (**1**).

13) Apparatus according to claim 12), in which special damping means may be envisaged for braking the downwards pivoting of the arms (**16**) which carry the spindle supporting the core (A) for storing the prestretched extendable film.

14) Apparatus according to claim 1, characterized in that it comprises an electric control panel (**19**) with an activation control device (**20**), a stop control device (**21**) and a timer (**22**) by means of which it is possible to select the activity time of the apparatus and consequently the quantity of prestretched film stored on the tubular core (A).

15) Apparatus according to claim 14), in which special optical and/or acoustic signalling means may be envisaged for signalling when the said apparatus has produced the reel of prestretched film of predefined weight, after the said timer (**22**) has stopped the gearmotor (**7**).

16) Apparatus according to claim 6), in which a pointer (**23**) may be fixed onto one end of the torque shaft (**17**) which projects from a sidewall (**101**) of the container (**1**), said pointer moving along a graduated scale provided on the outer face of the said sidewall (**101**), so as to indicate the weight or the diameter of the film stored on the tubular core (A).

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