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(54) Improvements in packaging film dispensers.

(57) A dispensing implement (10) for use in manually wrapping palleted loads with stretch film has a wheeled base (12, 14) on which a roll (11) of film is mounted for free rotation as film is drawn therefrom. The film leaving the roll (11) is taken in opposite directions in turn around two dispensing rollers (26, 28) mounted to turn on shafts (32) journalled between two yokes (30, 31). The yokes, shafts and rollers are pivotable on a mounting tube (34), so that as film is pulled from the apparatus, roller (26) is pressed against the supply roll (11). A gear train (36) ensures that roller (28) rotates at a greater peripheral speed than the other roller (26) so that the film is stretched longitudinally between the rollers. At least roller (28) has a high friction, helical rib configuration on its surface which serves to stretch the film laterally as it passes over this roller (28).

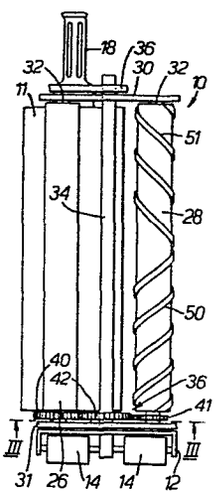

FIG. 1.

EP 0 081 328 A2

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"IMPROVEMENTS IN PACKAGING FILM DISPENSERS"

The present invention relates to improvements in packaging film dispensers, portable (i.e. hand operable) and otherwise, for wrapping objects with stretch film.

Stretch wrapping of objects such as pallet loads may involve costly motor-driven machinery. For stretching the film, the machinery includes controlled film feeding mechanism with involved constant speed motor drives, magnetic clutches and brake systems. Automatic wrapping machines are not always able to cope entirely satisfactorily where loads to be wrapped are variable as to their shapes and dimensions and where they may present sharp edges or corners likely to rupture the film during wrapping.

In many cases, manufacturers' or traders' businesses have too small an output to warrant the high capital costs of an automatic machine. Hand wrapping and its inherent flexibility is often the answer to such users' needs. Existing hand wrapping tools are of great simplicity but have one substantial drawback. That is, it is not possible to guarantee the film is properly stretched as it is wound around the object, so the security of the package can be

put at risk,

It has been noticed that stacks of objects circumferentially wrapped by machine as well as by hand sometimes adopt a tilted attitude in shipment. I suspect this is caused by a relaxation of the film.

The present invention seeks to remedy these drawbacks.

According to the present invention, there is provided a packaging film dispenser for wrapping objects with stretch film, comprising support means for rotationally receiving an upstanding roll of stretch film, dispensing means for withdrawing film from the roll, the dispensing means including a dispensing roller, an adjacent drive roller, and a carrier mounting the two rollers parallel to each other and to a film roll when loaded in the dispenser, the carrier being movable to press the drive roller into frictional driving engagement with the film roll when film therefrom is drawn from the dispenser along a path passing around both rollers, and a drive transmission coupling the two rollers so that in operation the ratio of the peripheral speed of the dispensing roller to that of the drive roller exceeds unity so as to positively tension film longitudinally as it is dispensed.

The drive transmission is preferably a gear train for simplicity, although a chain and sprocket system, or a vee-belt and pulley system, could be chosen instead.

The said ratio, whereby the peripheral speed of the dispensing roller exceeds that of the drive roller, can be of the order of 1.5:1. The ratio can be varied to suit the particular film and its stretchiness.

The rollers could be coupled by a 1:1 drive transmission, when their diameters will have to differ to achieve the desired speed ratio. Generally, however, the rollers will have the same diameter. Thus, in the preferred mode of practising the invention the gear train transmission will be designed for a gear ratio approximately or exactly equal to the desired speed ratio.

Conveniently the support means is furnished with ground-engaging rollers or wheels. It is found that such rollers or wheels considerably facilitate a pallet-wrapping operation.

According to the present invention, there is also provided apparatus for use in applying a stretch film wrapping to an object such as a loaded pallet, comprising means for withdrawing stretchable

film from a supply thereof and for conveying the film to a film dispensing means of the apparatus, means to stretch the film longitudinally in the course of its passage through the apparatus, and means to exert a pull on the film transversely of its length in the course of its said passage so as to confer a laterally stretch to the film dispensed from the apparatus.

The invention is applicable to automatic or semi-automatic wrapping machines as well as to hand wrapping tools. For instance the present invention can be embodied in a packaging film dispenser for manually wrapping objects with stretch film which comprises a handled support means for rotationally receiving an upstanding roll of stretch film, at least two dispensing rollers, and a carrier mounting the rollers parallel to each other and to a film roll when loaded on the dispenser, the carrier being movable to press

one of the rollers into frictional driving engagement with the film roll when film therefrom is drawn from the dispenser along a path passing around the rollers, and a drive transmission coupling the rollers so that in operation the ratio of the peripheral speed of the or a dispensing roller downstream of the said one roller to that of the said one roller exceeds unity so as to positively tension film longitudinally as it is dispensed. At least one of the dispensing rollers is furnished with the said lateral stretching means, preferably the last roller which the film encounters in the course of its passage from the apparatus.

The invention also provides a method of applying a stretch film wrapping to an object such as a loaded pallet, comprising the steps of attaching an end of the film to the object and winding the film around the object a plurality of times, while withdrawing the film from a supply thereof, the film being stretched longitudinally while it is dispensed from the supply to the object and also being concurrently stretched laterally.

The invention will now be described in more detail by way of example only with reference to the accompanying drawing in which:

Fig. 1 is a front elevation of a stretch film dispenser embodying the invention,

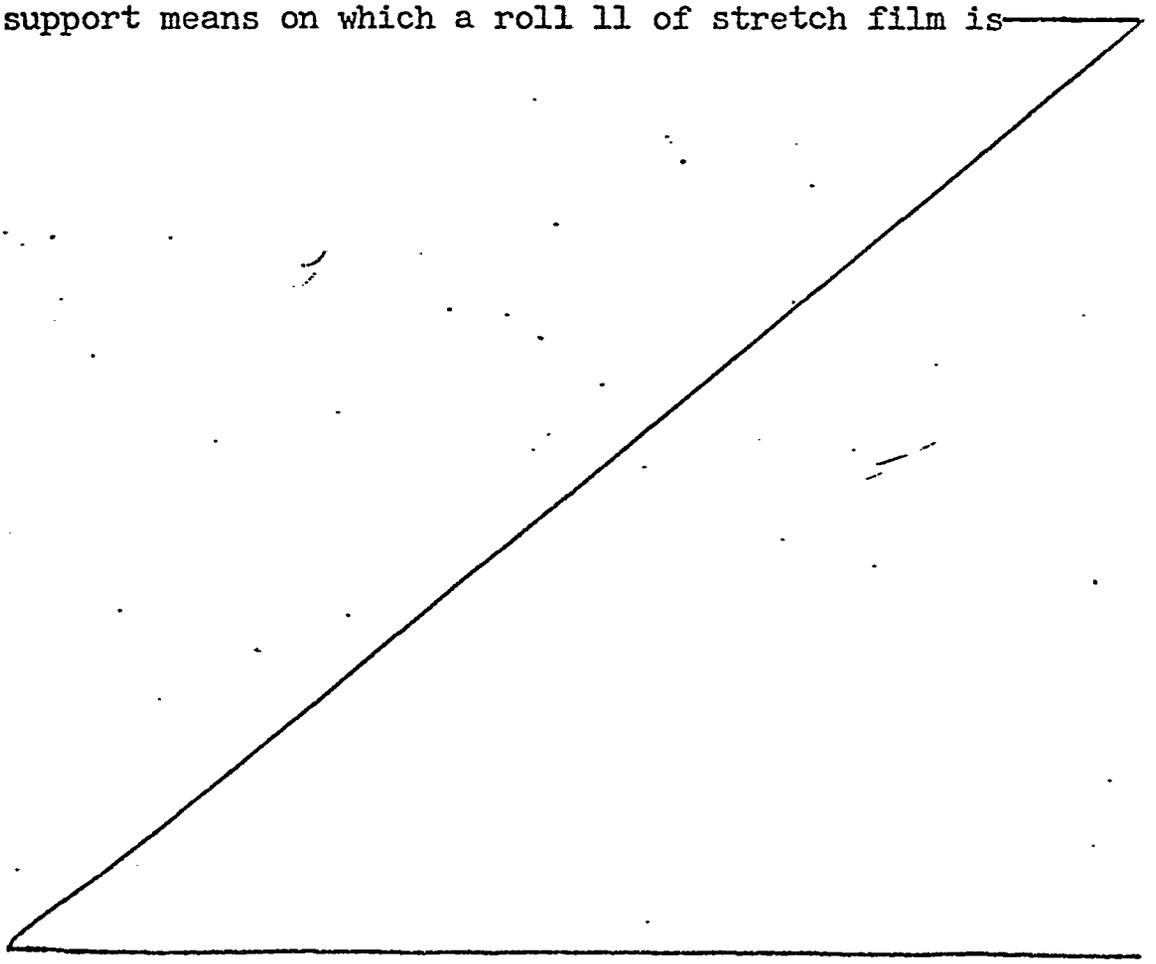
Fig. 2 is a side elevation of the film dispenser shown in Fig. 1,

Fig. 3 is a view on the line III-III of Fig. 2,

Fig. 3A is a view similar to Fig. 3 showing the film dispensing path, seen however from above, and

Fig. 4 is a front elevation of a modified dispenser embodying the invention.

The dispenser 10 shown in Fig. 1 has a handled support means on which a roll 11 of stretch film is



rotationally received. The support means comprises a flanged base 12, provided with ground-engaging wheels or rollers 14 at one end thereof, an upstanding film roll mounting 16 and two handles 17, 18. The mounting 16 is an upstanding tube or rod welded at its bottom end to the underside of the base 12. Plastics spacer ferrules 20, 21 are loosely mounted on the tube or rod 16. These ferrules have smaller diameter portions to fit snugly within the core tube 22 on which the roll 11 is wound, and larger diameter flange portions generally the same diameter as the O.D. of the core tube 22. The uppermost hand grip 18 is screw-threaded to the tube or rod 16. Once unscrewed and removed from the tube or rod 16, the dispenser can be dismantled appropriately for replacing an exhausted roll by a new roll 11.

The lower hand grip 17 is mounted on the free end of an upwards-extending curved arm 24. Arm 24 is welded to the underside of the base 12. As shown, the arm 24 is curved through an angle of less than 90° (e.g. about 70°), so that its free end carrying hand grip 17 is located close to the roll 11. Sufficient space is provided between the roll 11 and the hand grip 17 for the user's hand to grasp the grip 17 without his knuckles fouling the roll 11.

Mounted adjacent the roll 11, and parallel thereto and to each other, are upstanding first and second film-dispensing rollers 26, 28. These rollers are rotationally supported between two yokes 30, 31. To this end the rollers 26, 28 rotate on stationary shafts 32 affixed between the yokes 30, 31. The yokes 30, 31 are apertured approximately mid-way between the shafts and are pivotable on an upstanding tube or rod 34 welded at its lower end to the base 12. At its upper end the tube 34 is held by a bracket 36 fitted detachably on the tube or rod 16 and normally secured in place sandwiched between the hand grip 18 and spacer 20. The yokes 30, 31 and shafts 32 form a carrier, for the rollers 26, 28, which is pivotable about a vertical axis established by the tube 34. The dimensions and geometry of the carrier allows one of the rollers to be pressed continuously against the roll 11 despite its progressively diminishing diameter as the film is dispensed therefrom.

The roller which presses against roll 11 is roller 26. Thanks to a drive transmission 36 between the rollers 26, 28, roller 26 is rotated as film being dispensed from roll 11 passes over roller 28 and causes the latter to rotate. Frictional engagement between roller 26 and roll 11 drives the roll 11 in

an unwinding or dispensing direction. The preferred drive transmission 36 coupling the two rollers 26, 28 is a simple gear train. A chain and sprocket system, or a vee-belt and pulley system, could be utilised instead. The driving arrangement is such that the peripheral speed of the dispensing roller 28 is always greater than that of the drive roller 26 (and of the film roll 11). It follows, therefore, that the linear speed of film leaving the second, and final, dispensing roller 28 exceeds the linear speed with which it leaves the roll 11 and approaches the dispensing roll. This speed differential at the roller 28 positively tensions the film longitudinally as it is drawn from the dispenser 10 in an object-wrapping operation.

The gear ratio of the preferred gear train illustrated (i.e. the velocity ratio of the transmission 36) is determined by the ratio of the diameters of the rollers 26, 28 (where the diameters are unequal) and the desired percentage elongation or stretch tension required in the film. In the illustrated example, the rollers 26, 28 have the same diameters.

A 1:1 drive transmission between the rollers 26, 28 is permissible if roller 28 is appropriately larger than roller 26.

In the present embodiment, the gear train comprises two pinions 40, 41 each fast with a respective one of

the rollers 26, 28. In addition, the train has two idlers 42, 43. Idler 42 is freely rotatable about the tube 34, while idler 43 is rotatably journalled on the lower yoke 31. Pinion 40 and idler 42 meshing therewith possess the same number of gear teeth. This is true too for meshing pinion 41 and idler 43, although these have fewer teeth. The idlers 42, 43 mesh with one another. As a non-limitative example, pinion 40 and idler 42 can have 28 teeth while pinion 41 and idler 43 have 18 teeth. The gear ratio is thus 1.55:1 and hence as film is dispensed it is stretched longitudinally by 55%. Owing to the twin-idler arrangement, the rollers 26, 28 rotate in opposite directions. Contra-rotation could, of course, be accomplished if the idlers were omitted and pinions 40, 41 meshed directly. However, the use of idlers 42, 43 facilitate design.

The dispenser 10 is loaded with a film roll 11 after removing top hand grip 18 and lifting off bracket 36 temporarily. Film is drawn from roll 11 and passed around the rollers 26, 28 following the dispensing path shown from above in Fig. 3A.

As noted above, the film being dispensed is stretched longitudinally, e.g. by about 55%. Ordinarily this would cause a lateral contraction of the film.

Reduction of the film width of course is reflected in the amount of film needed to wrap a stack of objects. Moreover, it is believed that natural relaxation of the film wrapping may account for some slackening which can endanger the security of a wrapped stack of objects.

According to a preferred feature of this invention the dispenser is provided with means which establish lateral stretching in addition to the longitudinal stretching. The said means is associated with one or other or each of the dispensing rollers 26, 28, and operates to create a widthwise pull on the film as it is passing over the roller in question. As shown, the lateral stretching means comprises twin helices 50, 51 of appropriately opposite hands of friction material, e.g. a synthetic rubber strip, forming ribs on the exterior of at least roller 28. The rubber strip is bonded to the roller and, if the latter has a rubber surface, the rubbers can be secured by vulcanising together.

If means is provided to prevent one longitudinal edge of the film slipping along the ribbed roller 28, only one helix is required.

The pitch or pitches of the helix or helices is not too critical and can be found practically taking into account such factors as roller speeds

envisaged, the degree of film-wrap around the roller(s), the desired amount of lateral stretching and the particular film to be used. Rollers having twin helices need not have the pitches identical. Moreover, if both rollers 26, 28 possess helical friction windings, the helical pitch(es) on one need not be the same as the pitch(es) on the other.

It may be advantageous for the rubber strip to have a ribbed or otherwise contoured surface to increase the frictional grip exerted on the film as it is being laterally stretched.

If the roller(s) have rubber surfaces, then the helical friction windings could be moulded in situ as integral ribs thereon.

The dispensing rollers 26, 28 could possess smooth, low-friction surfaces if used in association with lateral stretching rollers formed as described above. The film would be fed through a nip between the dispensing roller and its associated stretching roller. In such an arrangement, the rotation of the latter roller will be responsible for creating the lateral pull and will ease the film being stretched along the more slippery surface of the dispensing roll.

It may be preferred to stretch the film in stages, when stretching will be performed at each of

the dispensing rollers.

In the absence of the present lateral stretching means, and depending on the longitudinal stretching, common wrapping films exhibit dispensed widths perhaps 70 to 75% of the width on the roll. By the present invention, the lateral stretching can limit the overall widthwise contraction, by way of example to 85%.

In use, when wrapping a loaded pallet for instance, the user first secures the free end of the film to the load. The film may be tied to the pallet. The user then walks around the pallet, assuming the pallet is not resting on a turntable. As he proceeds around the pallet, film is paid off the dispenser 10 and automatically tensioned or stretched.

The amount of longitudinal stretch is determined by the velocity ratio of the drive transmission and is self-governing. Thus, the tension will not be affected by the speed with which the user attempts to wrap the loaded pallet. It will be appreciated that the tension in the film being dispensed pulls the roller 28 generally away from film roll 11. This pivots the carrier 30, 31 and 32 about tube 34 and presses roller 26 against roll 11. Thus a positive driving engagement with roll 11 is established with a concomitant braking

effort which aids controlled dispensing of film.

Wrapping the lowermost part of the load is considerably eased by the rollers or wheels 14: the user simply runs the dispenser along the ground as he circles the loaded pallet.

When the film dispensed is also under tension across its width, the stability of a stack of articles is enhanced since the resulting vertical tension in the wrapping will help to hold the layers of the stack firmly on one another, even though the film may relax somewhat after wrapping is completed. The likelihood of layers slipping and leading to a tilted stack is reduced, therefore.

The modification shown in Fig. 4 functions in substantially the same manner as the embodiment already described. The reference numbers used hitherto are employed in Fig. 4 for corresponding components. The following description is directed to those aspects of dispenser 60 which differ from dispenser 10, to avoid unnecessary repetition.

The dispenser 60 has a substantially C-shaped, three sided frame 61 welded to the base 12. Frame 61 has hand grip 17 on its upstanding side 62. Upper side 63 of the frame 61 rotationally supports the upper ferrule 64 for entering the top end of the film roll

core 22. No central tube or rod extends from the upper ferrule 64 to the opposite lower ferrule 65 mounted rotationally on the base 12. The upper ferrule 64 is movable upwardly against an opposing bias provided by coil spring 67, when removing an exhausted film roll core and replacing it by a new film roll 11. Since there is no central tube or rod equivalent to component 16 of the dispenser 10, loading the dispenser 60 is considerably eased.

In dispenser 60, the second hand grip 18 is mounted screw-threadedly on the top end of the tube or rod 34 which pivotally supports the roller carrier composed of the yokes 30, 31 and shafts 32. The tube 34 at its lower end is apertured and mounted thereby between the rollers 14 on the roller axle. The top end of the tube 34 is received in a slot 68 or forked end of the upper frame side 63 and is retained therein by the hand grip 18 being screwed down to side 63.

In use, the ribs 50, 51 may wear and ultimately need replacing. The rollers 26, 28 - or the unit including them, the yokes 30, 31 and the shafts 32 - is simply removed in this embodiment for replacement by an exchange unit after unscrewing the hand grip 18, and displacing the top end of the tube 34 from the slot or fork 68.

If desired, the bottom end of the tube 34 could embody a hook or slot 69 for detachably connecting it to the said axle when the hand grip 18 is loosened. The removable unit would then include the tube 34.

The invention has been particularly described above in relation to an exemplary hand wrapping tool. It should be understood, however, that the invention is applicable to any hand tool or power machine for stretch wrapping, wherein the film is to be dispensed in at least a longitudinally-stretched state. For lateral stretching, all that is required is that such a tool or machine is furnished with a dispensing means capable of exerting a pull transversely of the film as it is being dispensed. The transverse stretching can be performed on the film before, after or at the same time as it is stretched longitudinally.

Claims:

1. A packaging film dispenser for wrapping objects with stretch film, comprising a support for rotationally supporting an upstanding roll of stretch film and film dispensing means for withdrawing film from the roll, characterised in that the dispensing means includes two rollers (26, 28), around which the film from the roll (11) is passed, mounted on a carrier (30, 31, 32) so that one roller (26) is caused to press against the film roll (11) while film is drawn therefrom and so that the roll and rollers are caused to rotate, and a drive transmission (36), coupling the rollers (26, 28) so that when dispensing the film, the ratio of the peripheral speed of the second (28) of the rollers which the film contacts to the peripheral speed of the roller (26) pressing against the roll (11) exceeds unity thereby positively tensioning the film longitudinally as it is dispensed.

2. A dispenser according to claim 1, characterised in that the rollers (26, 28) are of equal diameter and are coupled by a drive transmission (36), preferably a gear train, having a velocity ratio exceeding unity.

3. A dispenser according to claim 1, characterised in that the rollers (26, 28) are of

different diameters, roller (28) being the larger, and are coupled by a 1:1 drive transmission, the latter preferably being a gear train.

4. A dispenser according to claim 1, 2 or 3, further characterised by including means (50, 51) which stretch the film laterally as it is being dispensed.

5. Apparatus for use in applying a stretch film wrapping to an object such as a loaded pallet, comprising means for withdrawing stretchable film from a supply roll thereof and for conveying the film to a film dispensing means of the apparatus, characterised by means (26, 28) to stretch the film longitudinally in the course of its passage through the apparatus, and means (51, 52) to exert a pull on the film transversely of its length in the course of its said passage so as to confer a lateral stretch to the film dispensed from the apparatus.

6. Apparatus according to claim 5, characterised in that the means to stretch the film longitudinally comprise a roller system (26, 28) across which the film is drawn after withdrawal from the supply roll (11), the roller system including at least one driven roller (28)

having a peripheral operating speed greater than the linear speed by which the film is drawn from the supply.

7. Apparatus according to any of claims 4 to 6, characterised in that the means (50, 51) to stretch the film laterally is associated with a dispensing roller (28) of the apparatus.

8. Apparatus according to claim 7, characterised by two dispensing rollers one (26) of which has a smooth surface over which the film can slip in a direction transversely of the film and the other (28) of which is a lateral tensioning roller, the film in use being nipped between the two rollers (26, 28) and the tensioning roller (28) having a surface configuration which exerts a frictional, lateral stretching force on the film as the tensioning roller (28) rotates in contact with the film.

9. Apparatus according to claim 4, 5, or 6, characterised in that the means to stretch the film laterally comprises a dispensing roller (28) of the apparatus, which roller has a surface configuration which in use exerts a frictional lateral stretching force on the film as the roller rotates in contact with the film.

10. Apparatus according to claim 8 or claim 9,

characterised in that the lateral tensioning roller (28) is associated with means to prevent one longitudinal film edge from slipping along the said roller, and the roller has a helical rib (50 or 51) on its surface which in use exerts a frictional grip on the film and which is responsible for developing a widthwise pull on the film, away from the slip-preventing means, to stretch the film laterally.

11. Apparatus according to claim 8 or claim 9, characterised in that the lateral tensioning roller (28) has two helical ribs (50 and 51) on its surface which wind around the surface in opposite senses, the ribs in use exerting a frictional grip on the film and being responsible for developing opposed, outward widthwise pulls on the film, to stretch the film laterally.

12. Apparatus according to claim 10 or claim 11, characterised in that the or each rib (50, 51) itself has a ribbed or otherwise contoured surface to enhance friction between the film and the rib.

13. Apparatus according to any of the preceding claims 4 to 12, characterised by a plurality of lateral stretching means which stretch the film in stages in the course of its passage through the apparatus.

14. Apparatus according to any of claims 1 to 13, characterised by the apparatus being a film wrapping implement for use in wrapping objects manually with stretch film.

15. Apparatus according to claim 14, characterised in that it comprises a handled support means (12, 16) for rotationally receiving an upstanding roll of stretch film and provided with handles (17, 18), at least two dispensing rollers (26, 28) and a carrier (30, 31, 32) mounting the rollers (26, 28) parallel to each other and to a film roll (11) when loaded on the apparatus, the carrier being movable to press one of the rollers (26) into frictional engagement with the film roll (11) when film therefrom is drawn from the apparatus along a path passing around the rollers, and a drive transmission (36) coupling the rollers so that in operation the ratio of the peripheral speed of a roller (28) downstream of the said one roller (26), to that of the latter, exceeds unity, so as to positively tension film longitudinally in the course of dispensing it from the apparatus.

16. Apparatus according to claim 15, characterised by having just two dispensing rollers,

including the said one roller (26), and at least the roller (28) which the film encounters last in the course of its passage from the apparatus is furnished with the said lateral stretching means.

17. A dispenser according to claim 16, characterised in that the rollers (26, 28) are of equal diameter and are coupled by a drive transmission (36), preferably a gear train, having a velocity ratio exceeding unity.

18. A dispenser according to claim 16, characterised in that the rollers (26, 28) are of different diameters, roller (28) being the larger, and are coupled by a 1:1 drive transmission, the latter preferably being a gear train.

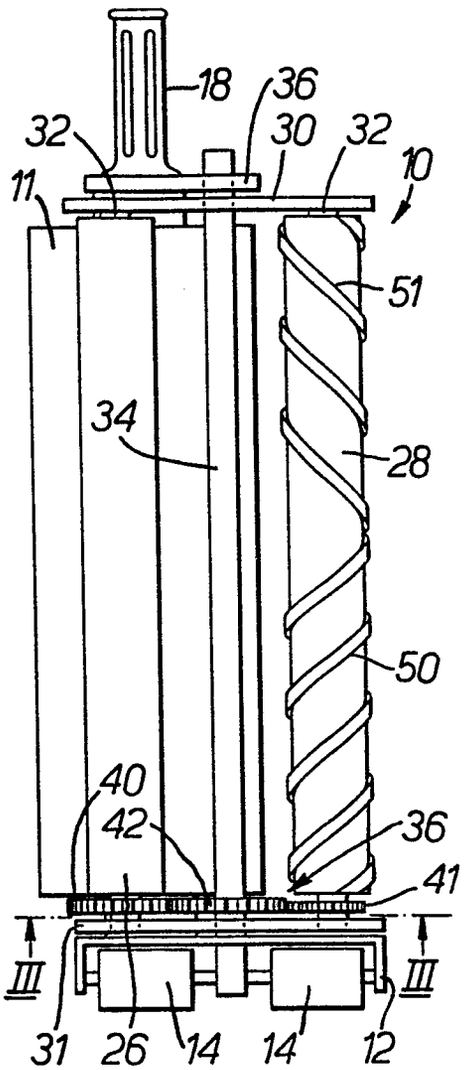


FIG. 1.

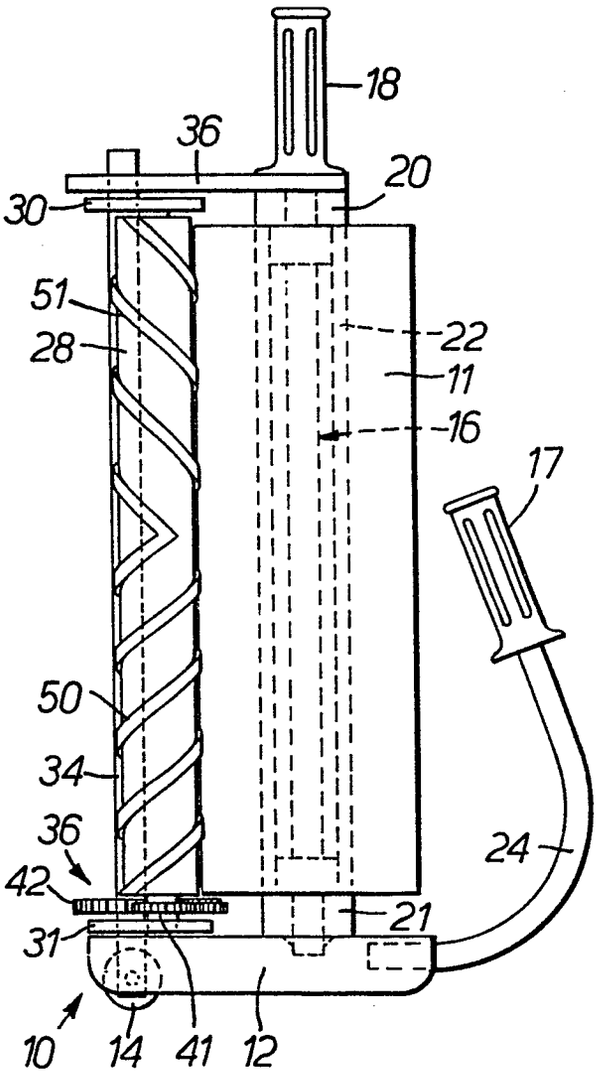


FIG. 2.

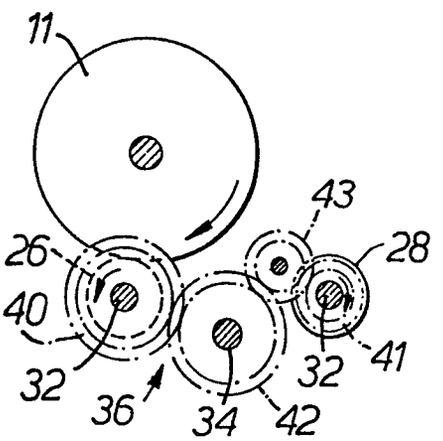


FIG. 3.

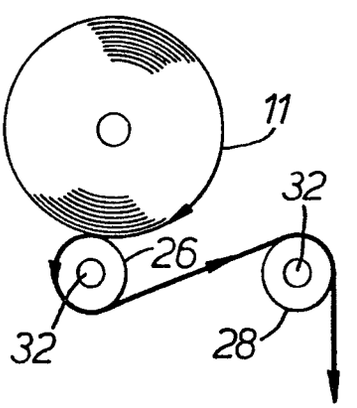


FIG. 3A.

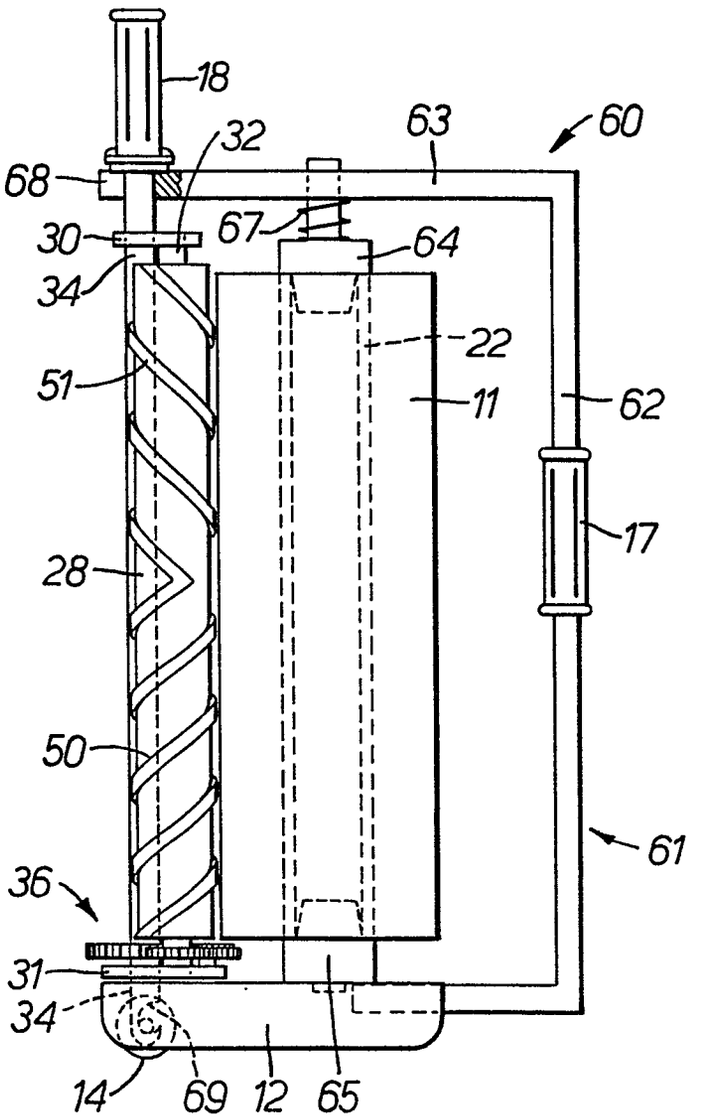


FIG. 4.