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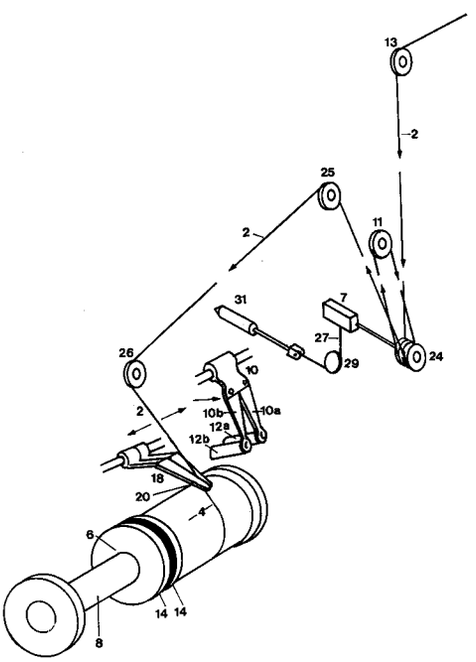
(54) Improvements in and relating to automatic yarn transfer.

(57) A yarn winding machine of the type comprising a yarn traverse guide which is caused to reciprocate along the length of one or other of two substantially axially aligned, rotatably driven bobbins, so as to wind the yarn on that bobbin, wherein an interrupter member is provided which is movable between an inoperative position, in which it is clear of the yarn path for winding, and an operative position, extending between the yarn traverse guide and the surface of the wound bobbin in order to engage the yarn during the transfer movement of the yarn traverse guide from the wound bobbin to the empty bobbin so as to deflect the yarn and prevent it from being wound onto the barrel of the empty bobbin until the yarn traverse guide has reached a position relative to the barrel of the empty bobbin conducive to the commencement of winding of yarn on the empty bobbin and the severing of the yarn connecting the wound or completed bobbin and the new, empty bobbin.

Fig.1



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This invention relates to textile yarn winding apparatus for winding flanged bobbins and in particular to a yarn winder which includes a yarn laying mechanism which may, for example, be in the form of a traverse guide screw and a yarn guide which is caused by engagement of a follower with the screw, to reciprocate or traverse along the length of a yarn package, e.g. a bobbin, to lay yarn evenly on the surface of the package. The yarn guide may be driven in other ways such as by a scroll, cam, belt, chain or the like.

It is desirable automatically to transfer yarn being wound from a full bobbin to an empty bobbin lying on the same axial plane without stopping the winding. This is particularly important when a yarn or filament is being delivered to the winder continuously at a controlled rate, e.g. directly from an extruder.

When yarn is being transferred from a full bobbin to an empty bobbin the yarn has to pass over the adjacent flanges of the two bobbins and then be wrapped around the barrel of the empty bobbin. The connecting yarn length is then severed so that the full bobbin may be doffed.

Our European Patent No. 0172664 describes one solution to the problem of enabling automatic transfer of yarn being wound from a full bobbin to an empty bobbin.

In the apparatus of the Patent, when the bobbin becomes the required full diameter, the yarn guide is automatically pivoted away from the surface of the full bobbin so as to be disengaged from the traverse screw which traverses the yarn guide back and forth along the length of the bobbin by engagement with a half-nut fixed to the end of the traversing guide remote from the yarn. The traverse guide is then quickly moved (pushed) lengthwise of the axis of the bobbin, bringing the yarn with it, to a position along, and above, the barrel of the empty bobbin so as to cause the yarn, passing over adjacent flanges of the full and empty bobbin to the barrel of the empty bobbin, to lie at an angle such that it may readily be cut by a hot knife which is moved to engage the angled length of yarn as the bobbin rotates. Momentarily before the yarn is engaged by the hot knife the traverse guide is lowered so that it engages its driving screw and causes it to be driven back towards the flange over which the yarn has passed, thus binding the yarn by trapping the cut length below the windings.

Such apparatus works very effectively on all sizes of yarn within a certain yarn delivery speed range but, with very high yarn delivery speeds, the traverse guide must be moved across to the empty bobbin at such a high speed in order to provide the necessary yarn angle for cutting, without loss of tension, that the yarn guide mechanism can be damaged due to mechanical shock, e.g. when the traverse guide re-engages the traversing screw. This can gradually reduce the reliability of the yarn guide traversing mechanism.

With a winding machine in accordance with this invention, an interrupter member is provided movable between an inoperative position in which it is clear of the yarn path for winding and an operative position extending between the yarn guide and the surface of a wound bobbin in order to engage the yarn during the transfer movement of the yarn traverse guide from the wound bobbin to the empty bobbin so as to deflect the yarn and prevent it from being wound onto the barrel of the empty bobbin until the yarn guide has reached a position relative to the barrel of the empty bobbin conducive to the commencement of winding of the new bobbin and the severing of the yarn connecting the completed (wound) bobbin and the new bobbin.

When the traverse guide is moved axially of the two bobbins the yarn follows a path from the surface of the full bobbin over the yarn engaging part of the interrupter (without engaging the bobbin flanges) until the traverse guide is at the required position along and above the empty barrel of the adjacent bobbin and once in that position the interrupter arm is quickly retracted to allow the yarn to spring into engagement with the flanges of the full and empty bobbin and form the necessary angle for cutting.

Thus the traverse guide need not be disengaged from the traverse screw nor the traverse guide moved from the full bobbin to the empty bobbin at a high rate. Indeed, it can be moved at the same traverse speed as during normal winding.

As the interrupter is withdrawn from contact with the yarn, when using a pivtable traverse (yarn) guide of the type described in European Patent No. 0172664 (which is not essential to the operation of this invention), the yarn guide pivots downwardly into engagement with or into close proximity with the barrel of the empty bobbin and the traverse screw, preferably, drives it back towards the flange of the bobbin over which the yarn passed. The part of the yarn interrupter which the yarn engages is preferably in the form of a roller so as to reduce the friction between the yarn and the yarn engaging member. As stated, the thread guide can travel at normal winding speed to the predetermined position along the barrel of the empty bobbin.

In order to maintain sufficient tension in the yarn during the transfer from the full to empty bobbin, the yarn preferably passes over a pivoting tension compensator which is preferably biased for quick reaction.

The apparatus of this invention is of very great benefit, particularly with fine extruded yarns which have a much higher extrusion speed than the

heavier counts but it also enables winding the heavier count of yarns extruded at the highest possible speeds. Furthermore, by enabling the precision screw to maintain control of the traverse guide at all times, without the need to be disengaged during the transfer movement as did their original arrangement, provides very fine precision control as mechanical backlash is kept to a minimum thus providing very precise reversal points.

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

Fig. 1 is a view of part of the apparatus illustrating yarn being wound on a first bobbin;

Fig. 2 is a similar view to Fig. 1 but illustrating the position of the parts just before the doffing sequence during which the yarn traverse guide will transfer the yarn from a full to an empty bobbin;

Fig. 3 is a similar view to Figs. 1 and 2 illustrating the position of the parts after transfer of the yarn and just prior to re-commencement of winding; and

Fig. 4 is a similar view to Fig. 3 but illustrates yarn being wound on the empty bobbin.

Referring to Fig. 1 a pivoted interrupter arm 10 is in its inoperative position clear of the normal winding path of the yarn 2. The arm 10 is provided with an extension comprising two pivoted fingers 10a, 10b, each of which at its free end has a roller 12a,12b extending transverse of the axis of the spindle so as to engage the yarn when moved into their operation position during the doffing sequence when the yarn is being transferred from the wound bobbin to the empty bobbin 8 on the axially adjacent spindle. The arm 10 is so positioned as to act for each pair of adjacent spindles irrespective of whether the yarn is being transferred from right to left or vice versa.

Just before doffing, as illustrated in Fig. 2, the interrupter arm 10 is pivoted forward so that the rollers 12a,12b cut across the path of the yarn passing from the yarn pulley 26 down to the barrel of the full bobbin. When in the forward position the fingers 10a,10b are driven by a mechanism (not shown) so as to move the rollers 12a,12b further apart and the outside of roller 12b engages the yarn. (When yarn transfer is in the other direction the yarn will engage the outside of roller 12a). As will be observed in Fig. 2, the yarn traverse guide 18 is in a raised position and the rollers of the interrupter arm are located between the barrel 4 of the bobbin and the raised traverse guide 18 and are clear of the adjacent bobbin flanges 14 of the full and empty bobbins.

As illustrated to the right hand side of Figure 1 is the tension compensator arrangement. It is in the form of a double pulley 24 mounted at the end of a pivoted arm 7 which is located upstream of the guide pulley 26. Other pulleys 11,13 which are in fixed positions determine the path the yarn takes on its way to the bobbin.

The yarn path actually forms a closed loop between the pulley 11 and the tensioning pulley 24 before passing on its way to another fixed pulley 25 and guide pulley 26. These tension pulley arrangements are similar to that illustrated at 24 in Figures 2 and 3 of our European Patent No. 0172664. In order that the arm 7 and pulley 24 reacts sufficiently quickly during the yarn transfer to the empty bobbin, it is loaded by means of an elastic cord 27 which passes over a pulley 29 and is connected at its other end to a pneumatic cylinder 31. (As an alternative a frictionless cylinder may be used).

Fig. 3 shows the traverse guide 18 moving axially of the bobbins to the position above the barrel of the empty bobbin 8 and passing above the flanges 14 of the adjacent bobbins. During this movement the elastic cord 27 causes extra tension to be put on the arm 7 by the piston 31 retracting into its cylinder and further stretching the elasticated cord. However, as soon as the interrupter arm is withdrawn, as shown in Fig. 4, the additional tension is removed from the elasticated cord by the piston being extended. The traverse guide lowers to its position closely adjacent the barrel of the empty bobbin 8 and the interrupter arm 10 is withdrawn from engagement with the yarn at virtually the same instant thus enabling the yarn to engage the empty bobbin and to make the necessary angle between the bobbin flange and bobbin barrel 14 for cutting. The cutting operation remains the same as is described in our European Patent No. 0172664.

During the few seconds that the interrupter yarn is in engagement with the yarn, if it is prevented from traversing a small ridge of yarn will form on the surface of the full package, which, with some yarns, may interfere with the free unwinding of the yarn at the next processing stage. Therefore, preferably, the fingers 10a,10b and hence rollers 12a,12b, when in the operative position, are driven to move (pivot) towards and away from each other during that period thus, in effect, traversing the yarn over a part of the length of the bobbin thus preventing any localised build-up of yarn on the surface of the bobbin. When the traverse guide 18 is in the predetermined position relative to the empty bobbin 8 the interrupter arm 10 can be pivoted back from the yarn path 2 at any time during this pivoting motion.

Such a winder has the advantage not only of enabling a higher traverse speed but also a precision ballscrew may be used both for normal tra-

verse and transfer. Previously an ordinary screw with a half-nut was used so that the half-nut could be lifted out of engagement and transferred to the empty bobbin at high speed. It was not possible to drive a screw at the necessary speed to transfer the thread guides themselves even at a moderate line speed hence the need for a half-nut. By using a precision ball screw much better control of winding can be obtained since mechanical backlash is kept at a minimum, and reversal points are maintained more accurately.

Furthermore, it is unnecessary for the yarn traversing guide 18 to lie within the flanges 14 of the bobbin close to or on the surface of the package, during normal winding and the yarn guide may take the form of a simple V-pulley which is made to reciprocate along the length of the barrel of the bobbin at a radial distance from the axis of the bobbin greater than the radius of the bobbin flanges so that it is unnecessary for the traverse guide 18 to move rapidly away from the bobbin during the doffing sequence.

Claims

1. A yarn winding machine of the type comprising a yarn traverse guide which is caused to reciprocate along the length of one or other of two substantially axially aligned, rotatably driven bobbins, so as to wind the yarn on the respective bobbin, characterised in that an interrupter member is provided which is movable between an inoperative position, in which it is clear of the yarn path for winding, and an operative position, extending between the yarn traverse guide and the surface of the wound bobbin in order to engage the yarn during the transfer movement of the yarn traverse guide from the wound bobbin to the empty bobbin so as to deflect the yarn and prevent it from being wound onto the barrel of the empty bobbin until the yarn traverse guide has reached a position relative to the barrel of the empty bobbin conducive to the commencement of winding of yarn on the empty bobbin and the severing of the yarn connecting the wound or completed bobbin and the new, empty bobbin.

2. A yarn winding machine according to Claim 1 comprising at least one roller mounted to the interrupter member in such a way that, with the interrupter member in the operative position, the axis of the or each roller extends traverse to the axis of the spindle.

3. A yarn winding machine according to Claim 2 wherein two rollers are mounted on fingers which are pivotably mounted to the interrupter member, means being provided to pivot the fingers so as selectively to move the rollers towards and away from each other.

4. A yarn winding machine according to Claim 3 characterised in that the means to pivot the fingers are adapated to operate when the interrupter member is in engagement with the yarn.

preceding claim comprising means to move the yarn traverse guide away from the axis of the bobbins prior to the transfer from the full to the empty bobbin so as to clear the flanges thereof.

6. A yarn winding machine according to any preceding claim comprising yarn tension compensator means to maintain tension in the yarn during the transfer from the full to the empty bobbin.

7. A yarn winding machine according to claim 5 characterised in that the yarn tension compensator means comprises a tensioning pulley which is loaded by tensioning means adapted to operate sufficiently quickly so as to accommodate the change in yarn tension required during the yarn transfer to the empty bobbin.

Fig. 1.

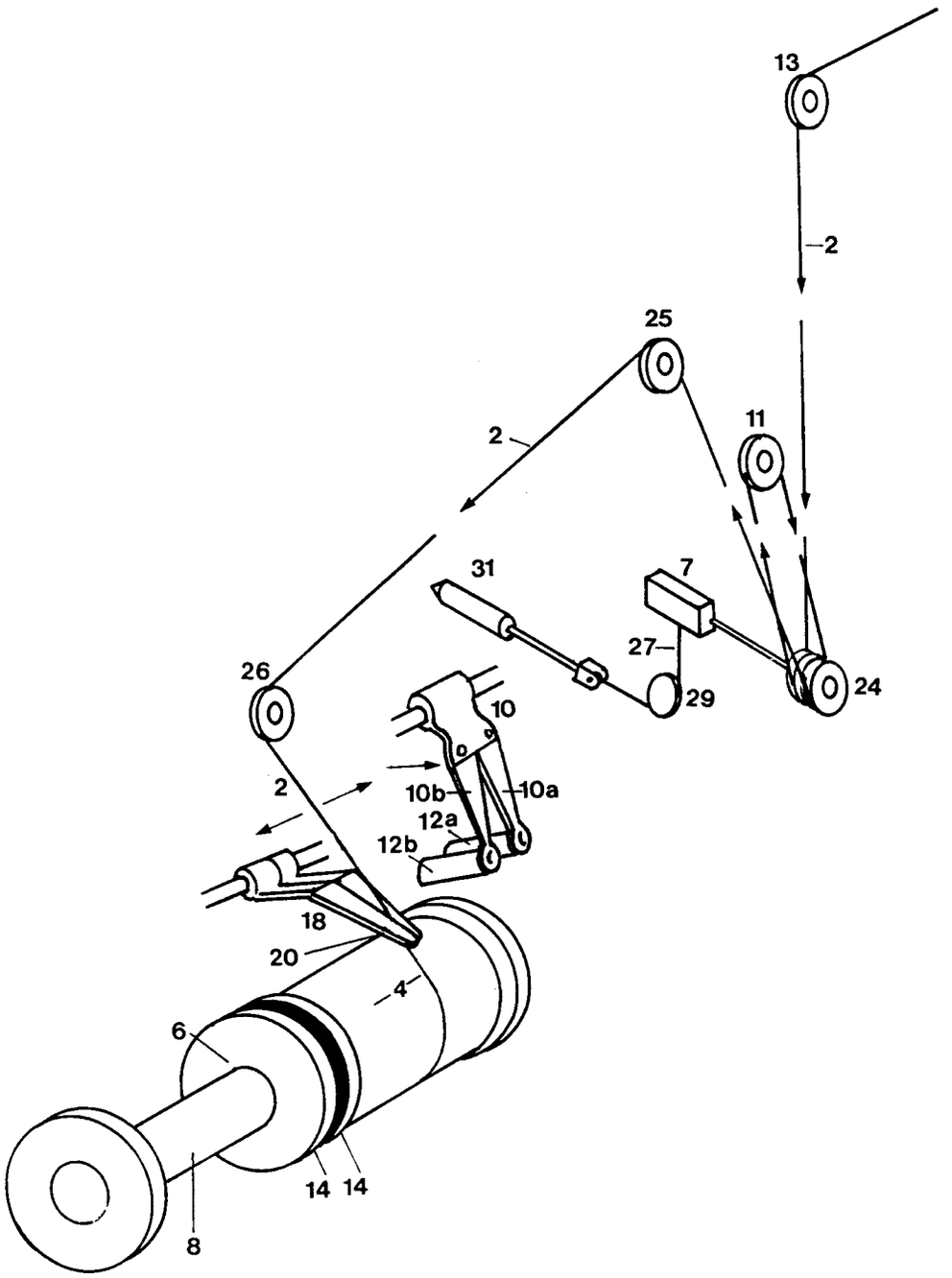


Fig. 2.

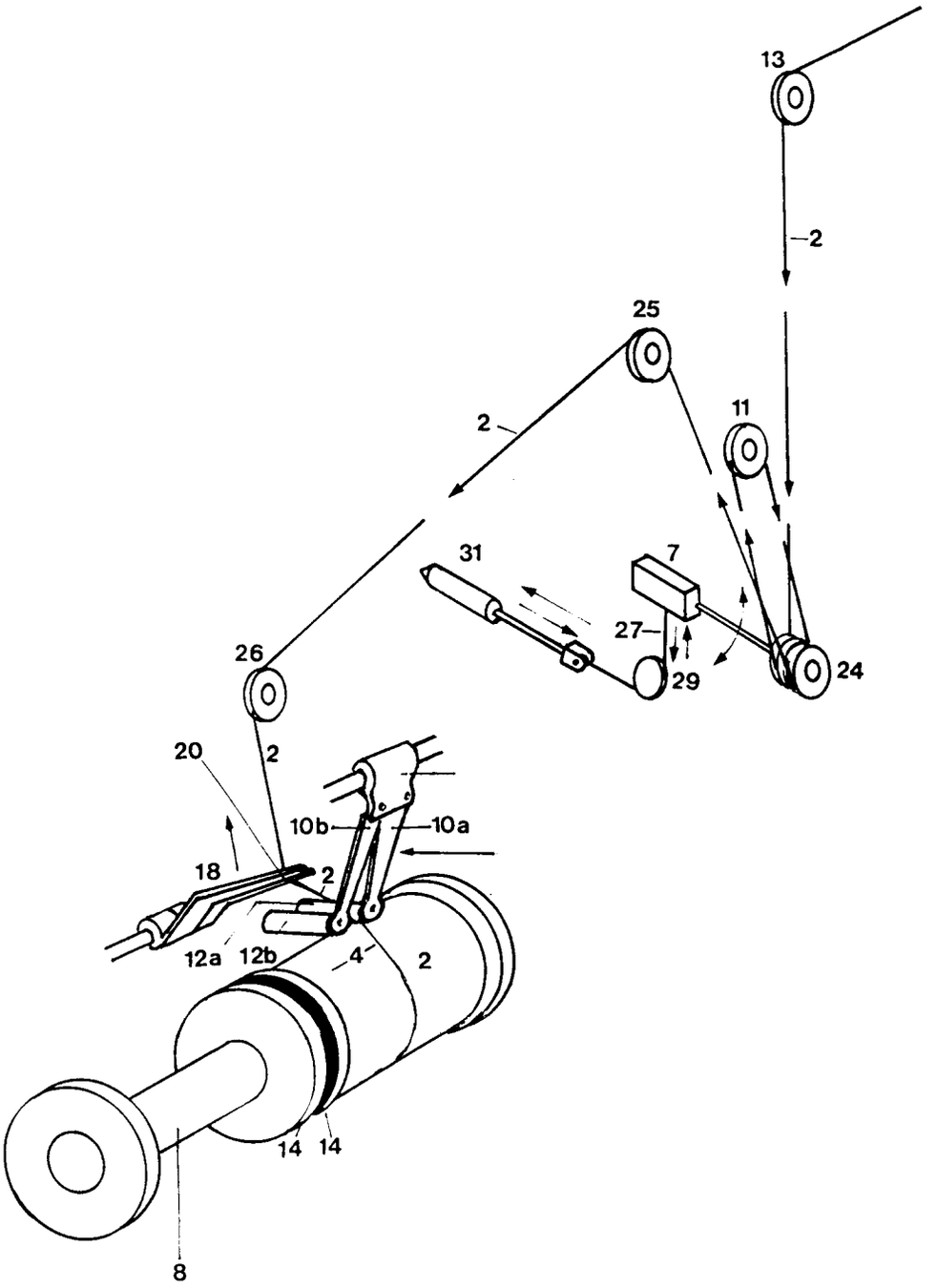


Fig. 3.

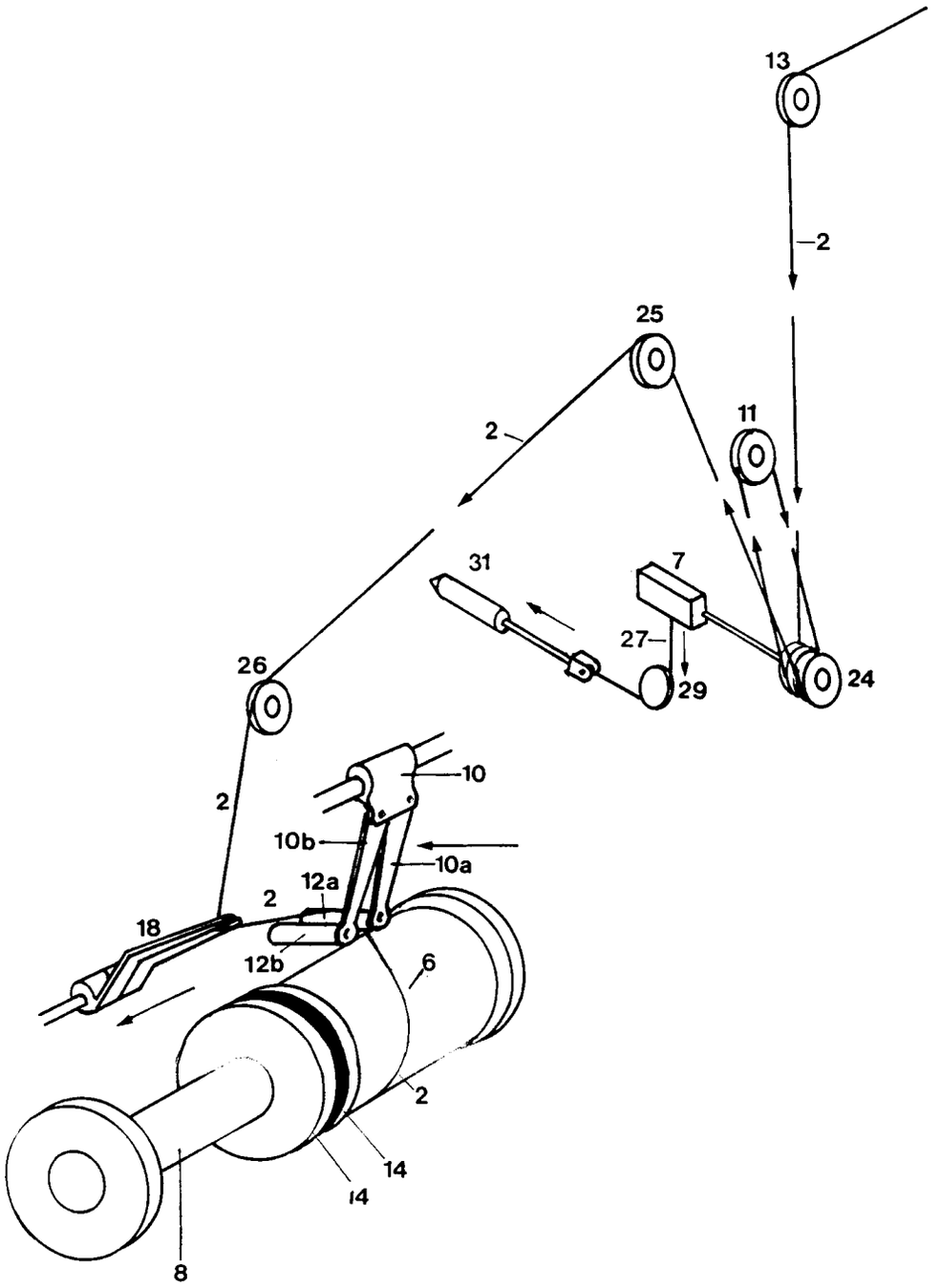
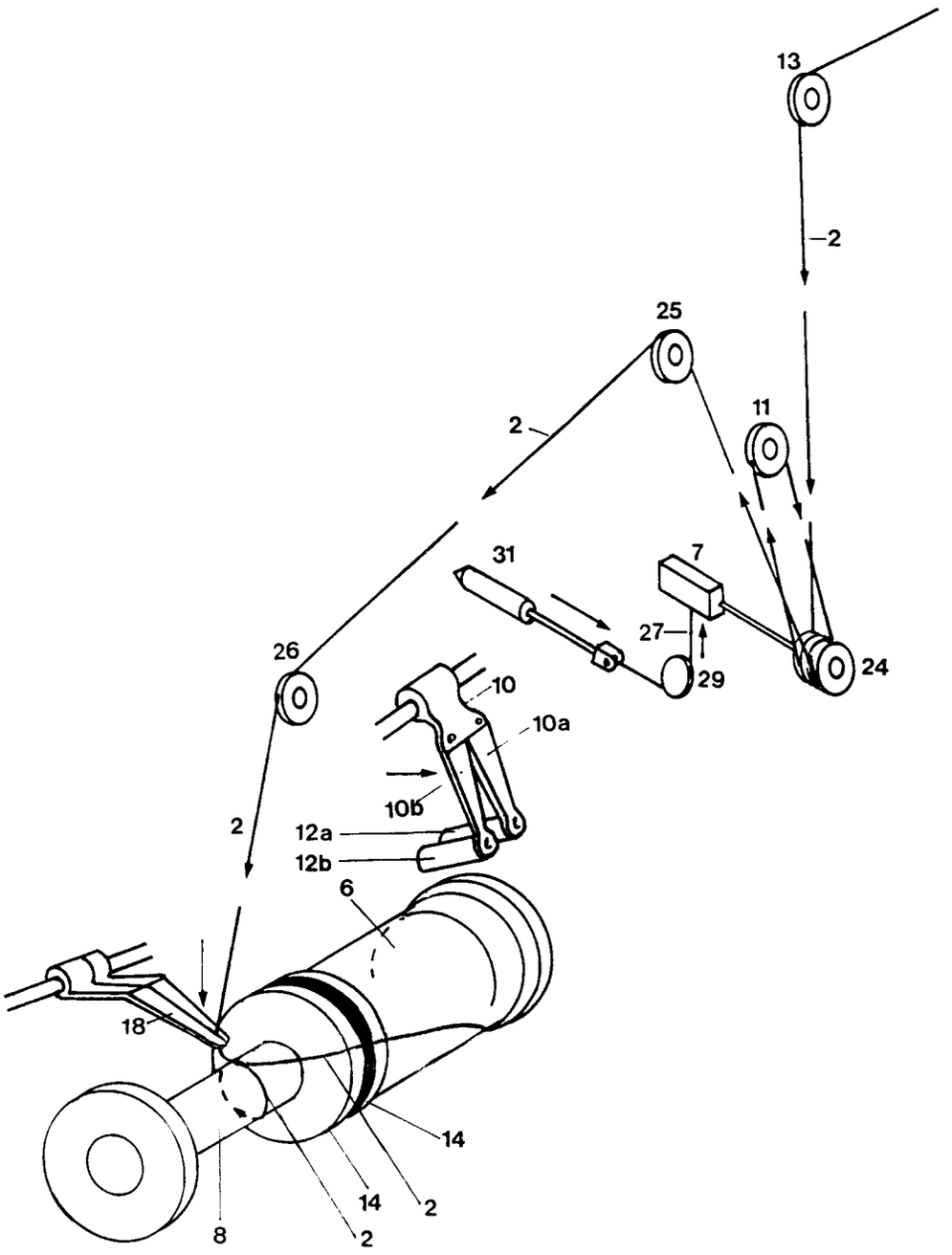


Fig. 4.



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EUROPEAN SEARCH REPORT

Application Number EP 93304777.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
D,A	EP - A - 0 172 664 (SAMES MACKIE & SONS LIMITED) * Fig. 3 * --	1	B 65 H 67/056
D,A	US - A - 4 784 341 (HILL et al.) * Fig. * --	1	
A	DE - A - 4 034 482 (PALITEX PROJECT-COMPANY GMBH) * Fig. * --	1	
A	EP - A - 0 282 105 (SAVISO S.P.A.) * Fig.; claims * --	1	
A	GB - A - 2 248 856 (RIETER-SCRAGG LIMITED) * Fig. * --	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	EP - A - 0 181 960 (KOLBUS GMBH & CO KG. REINKING MASCHINENBAU GMBH) * Claims * ----	1	B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-07-1993	NETZER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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& : member of the same patent family, corresponding document

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