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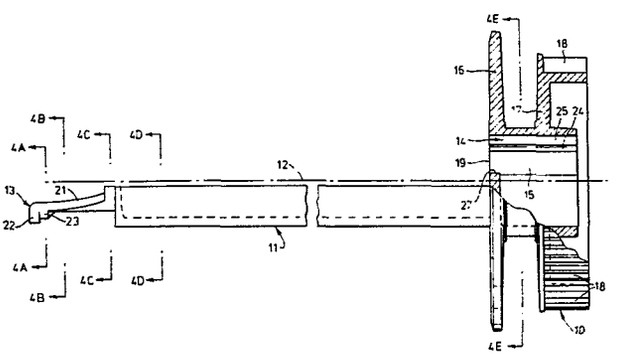
(54) Take-up spool.

(57) A take-up spool which comprises two identical components having respective elongate portions (11, 11A) which cooperate in side-by-side parallel relationship to form the core of the spool, the two components carrying two pairs of interengaging locking parts (13, 14) at the opposite ends of the elongate core portions (11, 11A), which locking parts (13, 14) are released by a relative unlocking movement of the two components which simultaneously brings about a relative bodily movement of the two elongate portions (11, 11A), which results in a reduction in the cross-sectional size of the core.



EP 0 010 928 A1

Take-up Spool

This invention relates to a take-up spool, more especially a take-up spool capable of reeling a strip of thin paper which issues from a printer or a strip of thin film.

When such a reel of paper or film bearing information is to be stored, it is necessary either to retain the complete spool or to be able to remove the wound reel from the spool. In the former case, it is a disadvantage that spare spools must be stocked by the user. Various proposals have therefore been made to permit removal of the reel from the spool, but hitherto no satisfactory solution has been found which does not result in damage to the strip at the innermost layers of the reel. This is because the reel must necessarily be relatively tightly wound for satisfactory storage, and when the mechanism of the printer does not itself produce a tight reel, it is conventional practice to tighten the reel by hand after removal from the machine.

Amongst various known proposals for radially expansible and contractable shafts, mandrels, arbors, rollers and the like is the arrangement disclosed in

U.S. Patent No. 3,143,313.

This known arrangement comprises a moulded spool of two identical separable parts, and is specifically intended to carry a wound web of strip material, in particular the paper tape used in data processors. The spool is therefore axially relatively short. Each part comprises a circular cheek with a short axially projecting semi-circular hub portion. When the two parts are assembled together, the two hub portions define a circular hub adapted for connection to a winder tab for driving the spool. For supporting the wound paper tape, the cheeks carry respective fittings for supporting four arcuate spring arms which define a resilient mandrel of substantially greater radius than the hub. The said fittings include toothed abutments which cooperate with toothed portions of the spring arms, in use to lock the two parts of the spool against relative rotation, with the spring arms deformed radially outwards. When the two parts of the spool are unlocked, the spring arms are released inwardly. In practice, however, although the reduced diameter of the resilient mandrel facilitates removel of a reel to a certain extent, the innermost layers of the latter are liable to be damaged by the radially fixed fittings on the flanges, particularly the toothed fittings.

This disadvantage would be worsened if the known construction was employed for a spool of increased axial length.

It is therefore an object of the present invention to provide a take-up spool which permits removal of the reel without causing damage thereto.

According to the invention, there is provided a take-up spool for strip material, comprising two components having respective substantially non-resilient elongate portions of respective cross-sections such that their assembly in adjacent parallel relationship defines a generally cylindrical core on which a reel of said strip material can be wound by rotation of the assembled spool about its axis, at least one of said components also having a portion through which a rotational drive can be applied, and said two components also carrying locking means which can be interengaged by a relative movement of the two components which completes assembly of the spool by locking the two components in their assembled condition, characterised in that the locking means comprise two pairs of interengaging locking parts, one part of each pair and the cooperating part of the other pair respectively being carried at the opposite ends of the respective elongate portions forming the core, and in that a reverse relative

movement of the two components at the commencement of disassembly simultaneously produces a bodily movement of the two elongate core portions relative to one another which results in a reduction in the cross-sectional size of the core, thereby permitting disassembly of the spool from a reel wound on the core.

In a preferred arrangement, the two components are identical, each one component having an elongate core portion which projects axially from a flanged driving portion and carries, at its end remote from the driving portion, one of said two interengaging locking parts, the cooperating locking part being formed within the flanged driving portion of the other component. Conveniently, in this preferred arrangement, assembly of the two components is effected with their respective core portions effectively in contacting sliding relationship, and the driving portionsof the respective components carry respective locating surfaces brought into engagement with the core portions as a result of the relative locking movement of the two components, whereby said locking movement is accompanied by a lateral bodily displacement of said core portions into an expanded slightly spaced relationship defining a slit for strip entry into the core. It follows that, at the commencement of disassembly, the relative unlocking movement of the two components disengages the core portions from the locating surfaces, permitting the core to collapse to a reduced cross-sectional size.

A practical arrangement of take-up spool in accordance with the invention will now be exemplified with reference to the accompanying drawings, in which:-

Figure 1 is a side view of one of two identical spool components, the driving portion being illustrated

in cut-away section;

Figure 2 is a plan view of the end of the core portion of the component remote from the driving portion;

Figures 3A, 3B and 3C serve diagrammatically to illustrate assembly and disassembly of two components which form a complete spool; and

Figures 4A to 4E are respective transverse cross-sections on the correspondingly marked section lines in Figure 1.

A preferred arrangement of take-up spool is assembled from two identical components each having the construction shown in Figure 1. This component comprises a portion 10 through which a rotational drive can be applied to the assembled spool, and an elongate portion 11 which, when assembled with the corresponding elongate portion of the other identical component, will form a generally cylindrical core for taking-up strip material to form a reel wound on said core. The axis of the component is indicated at 12.

The core portion has a ribbed construction as indicated in Figure 2, and at its free end remote from the driving portion 10 carries a locking means generally designated 13. The interior of the driving portion 10 is provided with a locking means 14 for inter-

engagement with the locking means 13 of the other identical component. The locking means 13, 14 will be described in more detail later. Briefly, when the two identical components are assembled together, one with its driving portion on the left-hand side and one with its driving portion on the right-hand side, a final relative rotational locking movement of the two components interengages the respective pairs of locking means 13, 14 to complete assembly of the spool by locking the two components against relative axial movement and continued rotational movement. Disassembly may be effected by a reverse procedure.

The driving portion 10 comprises a hollow hub 15, a peripheral flange 16 which in use serves as a lateral edge guide for the strip being wound on the core, and a flanged portion 17 supporting a gear wheel 18. The driving portion could of course be differently constructed to enable a drive to be imparted in other known ways. The opening into the hub 15 on the axially inner face of the driving portion 10 is partly closed by the core portion 11 of the component, which forms an integral structure with the driving portion 10 and projects therefrom in a direction parallel to the axis 12. As shown in the cross-sectional view of Figure 4D, the core

portion 11 has an arcuate cross-section extending over an obtuse angle somewhat less than 180 degrees. The driving portion 10 is thus left with an aperture 19 in its inner face which corresponds to a segment of a circle extending over an angle somewhat greater than 180 degrees, as shown in the cross-sectional view of Figure 4E. This aperture 19 receives the free end of the core portion of the other identical component.

The manner of assembly of the two components is indicated diagrammatically in Figures 3A, 3B and 3C. Figure 3A is a self-explanatory perspective view of the two components as they are brought together for assembly. At this time the relative angular orientation of the two components is to position the two core portions 11, 11A with two lateral faces in contact, as shown in Figure 3B, in which 11 refers to the component with the driving portion on the left in Figure 3A and 11A refers to the component with the driving portion on the right. When the two components have been pushed fully together in the axial direction, assembly is completed by a relative rotational locking movement of the two components, which twists the respective core portions 11 and 11A into the relative positions shown in Figure 3C, in which the other two lateral faces of these core portions are in closely

spaced relationship. As is clear from Figures 3B and 3C, the rotational locking movement of the two components also produces a small lateral relative displacement of the core portions 11 and 11A which expands the core to the cross-sectional size on which the reel is wound in use. The means by which this is done will be explained later. However, it will be apparent that, at the commencement of disassembly, a relative rotational unlocking movement in the reverse sense will collapse the core to a reduced cross-sectional size, thus releasing the core from the reel wound thereon and permitting complete disassembly to enable the reel to be removed. Figure 3C also shows that, in the locked condition of the assembled spool, the two core portions 11 and 11A define a slot 20 enabling the leading end of the strip to be wound to be attached to the spool, without any special preparation of the strip.

It is also convenient to mention at this point that the arrangement is designed so that the relative rotational locking movement for completing assembly is effected in the same rotational sense as that in which the spool will be rotationally driven in use.

The locking means 13 and 14 will now be described. The means 13 consists of a radially-

resilient generally axial extension 21 on the free end of the core portion 11. At its extreme end, the extension 21 has a shaped lateral projection 22 and just inwardly of this projection 22, a second shaped lateral projection 23 in radial alignment with the projection 22. The projection 22 is longer than the projection 23. The extension 21 has a reducing and varying cross-section towards its extreme end carrying the projections 22 and 23, and for better illustration of the shapes involved the parts 21 to 23 are shown in the cross-sectional views of Figures 4A, 4B and 4C. The locking means 14 comprises two angularly spaced axial grooves 24 and 25 on the inside wall of the hub 15 behind the aperture 19. The axial groove 24 (see Figure 4E) is shaped to match the above-described projection 22. During assembly, the projection 22 seats slidably in the groove 24 to assist axial guidance as the two components are pushed together in the axial direction. At this time the two core portions are relatively positioned as shown in Figure 3B. The two components are pushed together in the axial direction until a shoulder stop 26 (see Figure 2) at the leading end of the core portion 11 behind the locking means 13 comes to abut the inner end face of the hub 15 at the periphery of the aperture 19. At

this time, the arcuately-shaped trailing end of the extension 21 has just entered the aperture 19, while the lateral projection 22, but not the projection 23, has passed right through the driving portion 10 to be positioned just behind the rear face of the hub.

The rotational locking movement of the two components brings the core portion 11 to abut a locating surface 27 formed by one end edge of the aperture 19. The core portions of the two components are thus shifted laterally apart, as well as being twisted, to assume the relative positions shown in Figure 3C. In this connection, and referring to Figure 4E, it should be noted that one end edge of the aperture 19 is disposed on a radial line through the axis 12 while the edge 27 is slightly displaced from the parallel radius. The rotational locking movement of the two components also brings the lateral projection 23 into seating engagement with the matching groove 25 on the inside wall of the hub 15, locking the two components against reversed rotation by virtue of the inherent resilience of projection 21. At the same time, the projection 22 engages behind the rear face of the hub 15, adjacent the rear end of the axial groove 25. This locks the two components against axial movement.

It will now be clear that disassembly can be

effected by a relative rotational unlocking movement of the two components in the opposite sense to the locking movement. The core of the spool collapses to a reduced cross-sectional size during the unlocking movement, thereby to enable release of a reel of strip material which has been wound on the core, for example while the spool has been in use at the output of a printer. The reel is readily freed without damage to the inner layers, while the spool can then be re-assembled for further use.

It will be appreciated that various modifications are possible within the spirit and scope of the invention indicated in the appended claims. For example, the invention is applicable to other types of spool, including spools adapted to be rotationally driven in other ways and spools in which lateral guiding of the strip is rendered unnecessary by virtue of the provision of prior guides in the machine. In these and other circumstances, the use of two non-identical components may be desirable, and in its simplest form the spool may essentially consist of two core portions one of which is adapted to be rotationally driven, together with suitable inter-engaging locking means which, when unlocked, bring about a reduction in the cross-sectional size of the

core to facilitate release of a reel which has been wound thereon.

Claims

1. A take-up spool for strip material, comprising two components have respective substantially non-resilient elongate portions of respective cross-sections such that their assembly in adjacent parallel relationship defines a generally cylindrical core on which a reel of said strip material can be wound by rotation of the assembled spool about its axis, at least one of said components also having a portion through which a rotational drive can be applied, and said two components also carrying locking means which can be interengaged by a relative movement of the two components which completes assembly of the spool by locking the two components in their assembled condition, characterised in that the locking means comprise two pairs of interengaging locking parts, one part of each pair and the cooperating part of the other pair respectively being carried at the opposite ends of the respective elongate portions forming the core, and in that a reverse relative movement of the two components at the commencement of disassembly simultaneously produces a bodily movement of the two elongate core portions relative to one another which results in a reduction in the cross-sectional size of

the core, thereby permitting disassembly of the spool from a reel wound on the core.

2. A take-up spool according to claim 1, wherein the two components are identical, each one component having an elongate core portion which projects axially from a flanged driving portion and carries, at its end remote from the driving portion, one of said two interengaging locking parts, the cooperating locking part being formed within the flanged driving portion of the other component.

3. A take-up spool according to claim 2, wherein the said relative locking movement of the two components to complete assembly is a relative rotational movement and the relative unlocking movement is a relative rotational movement in the opposite sense.

4. A take-up spool according to claim 3, wherein the elongate core portion of each component has a cross-section corresponding to an obtuse-angled segment of a circle, and the driving portion of each one component has an aperture of shape generally corresponding to a circular segment covering an arc greater than said obtuse angle and for receiving the locking part at the end of the core portion of the other component.

5. A take-up spool according to claim 2 or claim 3 or claim 4, wherein the locking part carried on the

end of the core portion of each one component comprises a radially-resilient generally axial extension having a lateral projection for seating in a recess in an internal wall of the driving portion of the other component.

6. A take-up spool according to claim 5, wherein the said axial extension carries two angularly aligned lateral projections and the said internal wall has two angularly spaced seatings, the first projection cooperating with the first seating to assist axial guidance of the two components during assembly of the two components into cooperative relationship, and the second projection being brought into engagement with the second seating as a result of the relative rotational locking movement of the two components which completes assembly of the spool.

7. A take-up spool according to claim 6, wherein the first projection engages behind the rear face of the driving portion as a result of the relative rotational locking movement, thereby to locate the two components against relative axial movement.

8. A take-up spool according to any of claims 2 to 7, wherein assembly of the two components is effected with their respective core portions effectively in

contacting sliding relationship, and the driving portions of the respective components carry respective locating surfaces brought into engagement with the core portions as a result of the relative locking movement of the two components, whereby said locking movement is accompanied by a lateral bodily displacement of said core portions into an expanded slightly spaced relationship defining a slit for strip entry into the core.

9. A take-up spool according to any one of claims 2 to 8, wherein the driving portion of each component comprises a hollow hub, a peripheral flange for acting as a lateral edge guide for the strip to be wound on the assembled spool, and a driving gear behind the flange.

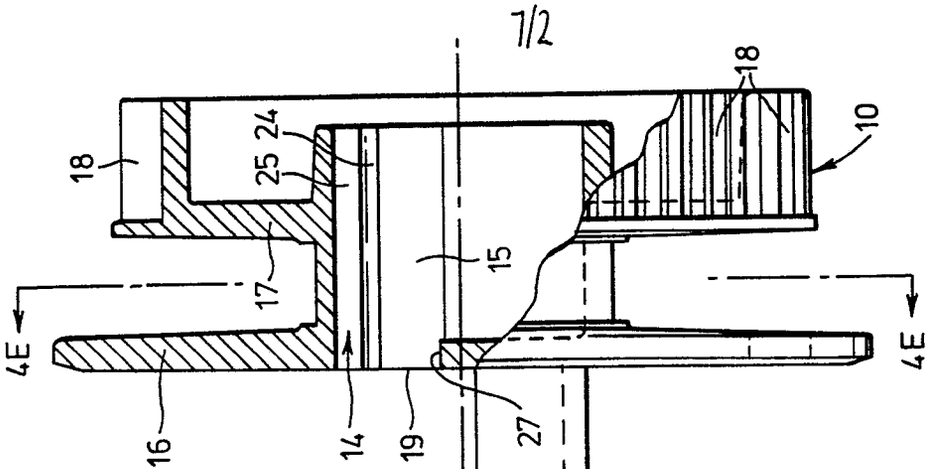


Fig.1

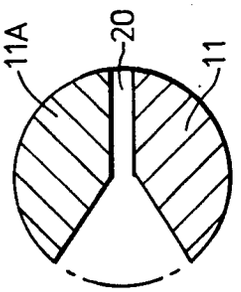


Fig.3C

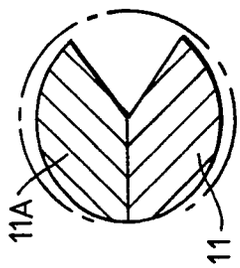
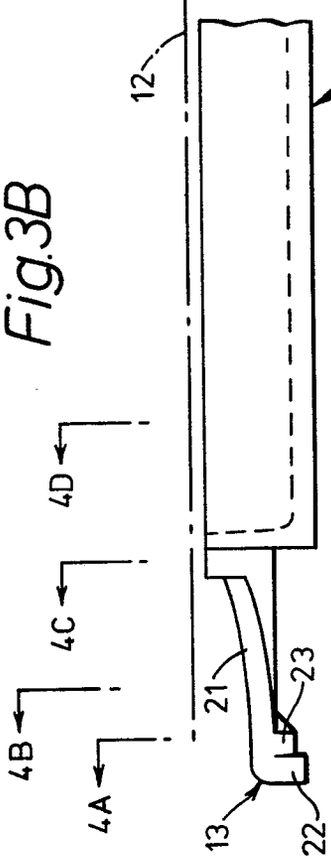


Fig.3B



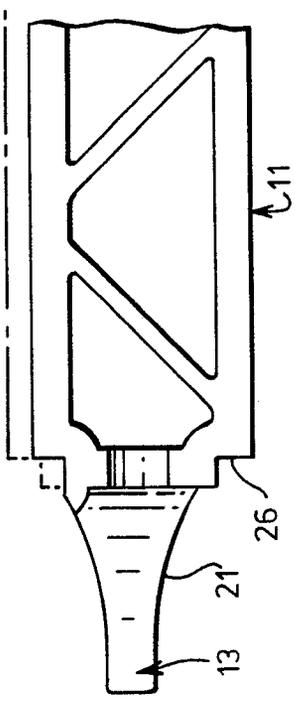


Fig.2

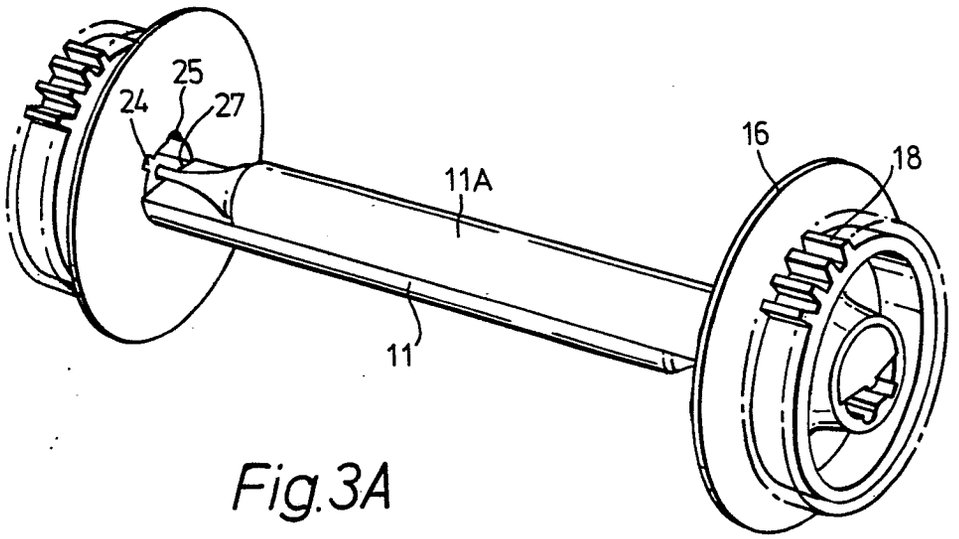


Fig.3A

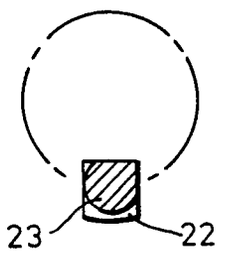


Fig.4A

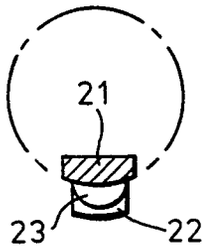


Fig.4B

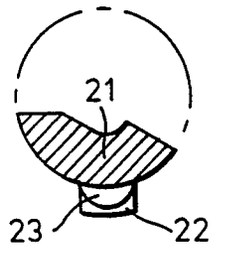


Fig.4C

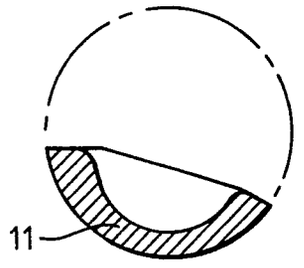


Fig.4D

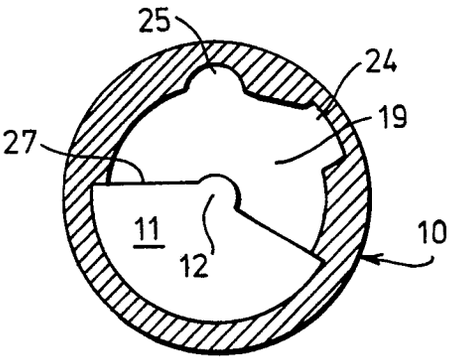


Fig.4E

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 79 30 2330

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
D	US - A - 3 143 313 (PURZYCKI) * Column 1, lines 14-52; column 3, lines 29-75; column 4, lines 1-19 *	1-3,8
A	US - A - 2 192 358 (LIEBER) * Page 2, right-hand column, lines 30-48 *	1
A	US - A - 1 530 003 (LARSON) * Claims 1,2; figures *	1,2
A	DE - C - 946 586 (MENZEL) * Figures *	1,2
A	DE - A - 2 157 776 (SCHICK) * Figures *	1,2
A	GB - A - 1 430 735 (BELLING & LEE) * Figures *	1,2
A	US - A - 3 433 355 (SMITH) * Column 3, lines 60-75; column 4, lines 1-38 *	1
A	US - A - 2 024 178 (MORRISEY) * Page 2, right-hand column, lines 18-73 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

B 65 H 75/22

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 65 H
B 41 J
G 11 B
G 06 K
G 03 B
G 03 G

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16-01-1980	D'HULSTER

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