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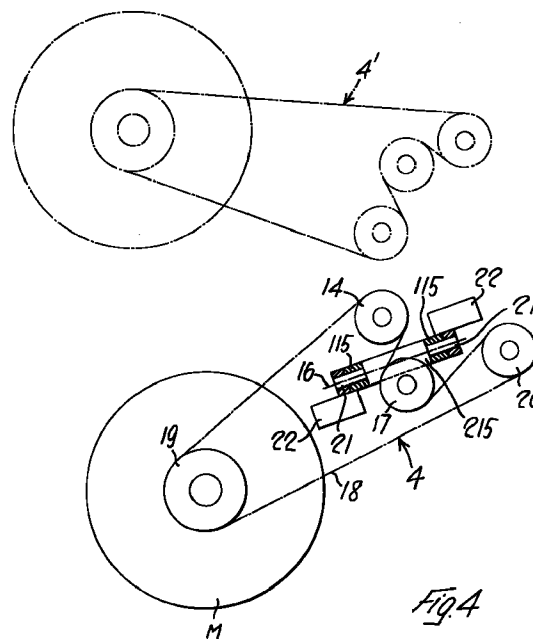
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(54) Device for feeding webs of material alternately from two different reels

(57) In a device for feeding webs of material alternately from two different reels, one a working reel (1) and the other a replacement reel (2), the two webs of material (101, 102), which may be, for example, paper, foil or the like, unwound from said reels, are guided to separate pulling units (4, 4'), one for each web of material (101, 102). The pulling units (4, 4') consist of pairs of cooperating pulling rollers (104, 204) rotating in opposite directions, between which the corresponding web of material (101, 102) is passed. According to the invention the pulling rollers (104, 204) of each pulling unit (4, 4') are driven simultaneously together by a common timing belt (18) engaging with a motorized pulley (19, M) and at the same time with respective drive pulleys (14, 17) integral in rotation with the corresponding pulling rollers (104, 204).



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Description

The invention relates to a device for feeding webs of material alternately from two different reels, one a working reel and the other a replacement reel, the two webs of material, which may be, for example, paper, foil or the like, being guided from the associated reels to separate pulling units, one for each web of material, which pulling units consist of pairs of cooperating pulling rollers rotating in opposite directions to advance the webs and between which the corresponding web of material is passed.

Especially in cigarette packaging machines, these devices are used in combination with joining devices which attach the tail end of the web unwound from the finished working reel to the head end of the web unwound from the replacement reel. This saves having to stop the packaging machine and means that the finished working reel can be replaced by a full reel while the web of material is unwinding from the full replacement reel.

The webs of material are unwound at very high speed, and the continuous web of material must furthermore be cut to shape in a subsequent cutting station. The pulling units must therefore ensure a constant speed of advance of the web of material within comparatively close limits. At present, the contrarotating pulling rollers are driven by a motor connected dynamically by a timing drive belt to only one of the two pulling rollers, while the associated second pulling roller is turned by the first by gears coupled in rotation to each of the two mutually engaged contrarotating rollers. The surfaces of the pulling rollers must act on the web of material with a certain pressure and the two pulling rollers of each unit must be subject to a certain compression against each other. Consequently the ideal regulation of this compression, both as regards the surfaces of the pulling rollers acting on the web of material and as regards the mutual compression between the two drive gears, is critical, and the ideal compression of the pulling rollers on the web of material does not generally correspond with an ideal compressive force between the two gears. This leads to rapid wear of the pulling unit, with the result that the requisite accuracy of advance soon declines and more or less frequent maintenance work becomes necessary, with all that this entails in terms of interrupting the production cycle.

It is therefore an object of the invention to provide a device of the kind described in the introduction in such a way that, with a simple and relatively inexpensive construction, it will be possible to overcome the problems enumerated above.

The invention achieves this object by means of a device of the kind described in the introduction, in which the contrarotating pulling rollers of each pulling unit of the web of material are driven simultaneously together by a timing belt engaging with a motorized pulley and at the same time with respective drive pulleys integral in rotation with each of the pulling rollers.

This construction completely eliminates the problems caused by the need to achieve the ideal mutual compression of the pulling rollers and of the drive gears, and not only simplifies the regulation of the mutual compression of the pulling rollers but also leads to a longer service life of the device.

Another feature is that one of the two pulling rollers of each pulling unit is supported in a fixed position, while the second is able to pivot between a working position, in which it presses against the first pulling roller, and a position of angular distance, in particular about a hinge axis that extends transversely relative to the axes of said pulling rollers, the drive pulleys of the two pulling rollers being mounted on the corresponding ends of axial extensions of shafts supporting the said pulling rollers, and the hinge axis of the pivoting pulling roller being located in the region of the end of the corresponding shaft on which the drive pulley is supported.

The axial extensions of the shafts on which the drive pulleys are mounted are of such a length that the difference between the compressive forces of the two pulling rollers at one end as compared with those at the other, that is between the compressive force furthest from and that nearest to the hinge axis, is less than the tolerances necessary for the correct feeding of the web of material.

In particular, the hinge axis is located in an intermediate position between the corresponding pulling roller and the associated drive pulley and in such a position, relative to the pulling roller and the corresponding drive pulley, that when at a sufficient angular distance from the cooperating fixed first pulling roller to permit the introduction of the web of material, the angular displacement of the drive pulley is minimal, i.e. can be absorbed by the intrinsic elastic deformability in the direction of twist about its axis of the timing belt, without the belt coming off the angularly displaced drive pulley or any separation of the teeth of the drive pulley and of said timing belt.

Said hinge axis is preferably contained in a plane transverse to the axis of the drive shaft which intersects the drive pulley transversely near the periphery of the inward side of the pulley and which hinge axis extends along a tangent or secant of said drive pulley, while hinge means are provided that form a recess to accommodate the pulley and to provide room for the drive belt.

The means for regulating the mutual compression of the two pulling rollers against each other consist in this case of an elastic part which urges the two pulling rollers towards each other and which is located near those ends of the supporting shafts of said pulling rollers which are furthest from the ends on which the drive pulleys are supported. Said means simultaneously act as the means for locking the pulling rollers in the working position, the pivoting pulling roller being moved angularly away from the stationary roller against the action of said elastic means of mutual compression.

By the above means it is possible to achieve great simplicity of construction of the pulling units because

there is no longer any need to provide, which is usual in current devices, an elastic suspension of the pivoting pulling roller at both of the supporting ends of the shaft. It is therefore unnecessary to make supports for transverse movement in rotation of the shaft. Even while the pivoting pulling roller is being moved angularly to its distant position, the kinematic connection of the two pulling rollers with each other and with the drive motor remains active, and this guarantees that the two rollers are always in the correct position relative to each other and makes it much easier to restart the device.

The invention also covers other features which further improve upon the device described above: these are the subject of the dependent claims.

The special features of the invention and advantages provided thereby will be shown in greater detail by a description of a preferred embodiment illustrated by way of a non-restricting example in the accompanying drawings, in which:

Fig. 1 is a schematic view of a cigarette packaging machine fitted with a device according to the invention.

Fig. 2 shows a section on a plane transverse to the axes of the pulling rollers of the pulling units of the device according to the invention.

Fig. 3 is a view along the axis of the webs of material on the inlet side of the pulling units of the device according to the invention.

Fig. 4 is a schematic view of the belt means and drive means of the pulling rollers of the device shown in the previous figures.

Fig. 5 shows a pulling unit with a pivoting pulling roller moved angularly away from the associated stationary pulling roller.

Fig. 6 shows a schematic perspective view of the drive and belt means of a pulling unit in the configuration in which the pivoting pulling roller is moved angularly away.

With reference to the figures, a machine, especially a cigarette packaging machine, possesses a station for feeding wrapping sheets cut from a continuous web of material unwound from reels. The feeding station has two supporting shafts, one projecting from a working reel 1 and the other from a replacement reel 2: from these, following different paths, the corresponding webs 101, 102 are guided through respective festoons 3, 3' to respective pulling units 4, 4'. The paths of the webs 101, 102 converge and are brought one on top of the other at least along their terminal lengths 8, 8'. Near said converging terminal lengths 8, 8' are the two pulling units 4, 4' which are arranged symmetrically either side of a plane passing midway between the two converging lengths 8, 8' of the paths of the webs 101, 102. In particular the pulling units 4, 4' are located in the region of the angle more or less directly upstream of a joining station 5 in which the paths 9, 9' of the two webs 101, 102 are parallel and one on top of the other and in which the

head end of one web 102 is stationary. As the working reel 1 is used up, the corresponding head end of the web 102 is joined to the tail end of the finished web of material 101 from the working reel.

Fig. 2 shows the final end of the converging paths 8, 8' for the two webs of material 101, 102 which then continue downstream exactly parallel and one on top of the other 9, 9'.

The two pulling units 4, 4' each include a pair of pulling rollers 104, 204 and 104', 204' which are parallel to each other and whose axes are aligned in a plane transverse and perpendicular to the corresponding web of material 101, 102.

The two pulling units 4, 4', are of identical construction, so the following description will refer only to one pulling unit 4.

The two pulling rollers 104, 204 illustrated each consist of two pairs of coinciding wheels mounted coaxially with each other on a supporting shaft 10, 11. The supporting shaft 10 of the innermost pulling roller 204 is mounted in bearings 12 so as to be able to rotate about its axis while being fixed in position between two side walls 13 of a mounting cage. At one end it projects out beyond one of said walls 13 in the form of a coaxial extension 110 on which is mounted, in such a way as to rotate with it, a coaxial drive pulley 14, preferably having teeth.

The shaft 11 of the outermost pulling roller 104 turns in bearings 12 in a mounting 15 hinged at 16 to allow it to pivot about an axis transverse - in particular perpendicular - to the axis of the two shafts 10, 11 and approximately parallel with the longitudinal axis or with the plane of travel along the corresponding path 8 of the corresponding web of material 101. Said hinge axis 16 is located on the outward side of the wall 13 beyond which projects the extension 110 of the fixed-position shaft 10. The shaft 11 similarly extends beyond the hinge end of the mounting 15 and projects out from the corresponding wall 13 through a slot 113 in the form of a coaxial extension 111. A toothed pulley 17 is mounted on the outermost end of the extension 111 of the shaft 11 in such a way as to rotate with it and be in an axially aligned position with the drive pulley 14 of the fixed-position shaft 10.

As indicated in Figures 3 to 5, the hinge axis 16 is located in a plane transverse to the axis of the shaft 11 which intersects the associated pulley 17, in the peripheral axial portion at the inward end of this pulley, that is the end facing the corresponding pulling roller 104, while the radial distance between the hinge axis 16 and the axis of the pulley 17 is such that the hinge axis lies on a tangent or a secant of the pulley 17. In the example illustrated, the hinge axis 16 is at a radial distance from the axis of the drive pulley 17 which is between the external radius of the drive belt 18 passing around said pulley 17 and the radius of the depressions between the teeth of said drive pulley 17 or a radius slightly smaller than the latter. For preference, the radial distance between the hinge axis 16 and the axis of the pulley 17

is less than the internal radius of the drive belt 18 and/or of the teeth of said drive pulley 17. Furthermore, the hinge axis 16 is contained in a plane transverse to the axis of the drive pulley 17, and in particular one perpendicular thereto, which plane is located near that longitudinal lateral edge 118 of the drive belt 18 which is closest to the associated pulling roller 104 or in which plane is contained said longitudinal lateral edge of the drive belt 18.

In order to make possible an arrangement such as that described, the hinge means are formed with a recess 215 to accommodate the pulley 17 and to provide room for a timing drive belt 18 which dynamically connects the two pulleys 14 and 17 both with each other and with a motorized M drive pinion 19. In particular the hinge end 115 of the mounting 15 is fork-shaped and coaxial holes are made in the ends of the arms of this fork to receive coaxial hinge pins 21 which engage at the same time in coinciding holes in mountings 22 fixed on the outside of the wall 13 next to the outward side of the corresponding arm of the forked end 115 of the mounting 15.

The distance between the arms of the forked hinge end 115 of the mounting 15 is such as to form the recess 215 for accommodating the drive pulley 17 and for providing room for the belt 18.

At the opposite end from the hinge end, the pivoting mounting 15 is connected to the corresponding wall 13 of the supporting cage by means of an elastic part 24 which is loaded so as to keep the mounting 15 in the correct angular position for the corresponding pulling roller 104 to work against the associated pulling roller 204, while furthermore exerting a predetermined force of compression of the two pulling rollers 104, 204 against each other, of a magnitude that will ensure that the web of material 101 is advanced correctly. Because of the use of a timing belt 18 to drive the unit, regulation of the compressive force between the pulling rollers 104, 204 is not critical and can vary between comparatively wide tolerances. The axial projections 110 and 111 of the shafts and consequently the position of the hinge axis 16 are such that the pressure difference present between the two pairs of cooperating wheels forming the rollers 104 and 204 is at a safe level below the tolerances acceptable for compression of the web of material 101.

In addition, the locating of the hinge axis 16 on a secant through the associated drive pulley 17 makes it possible to keep the angular movement of this drive pulley 17 within limits such that (see Figs. 5 and 6) this movement can be absorbed by the intrinsic elasticity of the timing belt 18 and by the position of the fulcrum of the hinge axis 16 (see Fig. 5) with respect to the way in which the belt 18 wraps around the very precise positions of the four pulleys concerned 19, 14, 17, 20 (see Fig. 4), without stressing the latter in any damaging way and without causing the teeth of the belt 18 to disengage from those of the drive pulleys 17, 14 or the belt 18 itself to shift in any way. At the same time it is ensured

that the pulling rollers 104 and 204 are moved sufficiently away to allow easy access for the operations of inserting the web of material 101. Because of the special construction of the drive and belt means 18, 14, 17 carrying the motion to the pulling rollers 104, 204, the device according to the invention makes unnecessary the provision of mechanically stable removable means of locking the mounting 15 in the working position of the associated pulling roller 104 and consequently of the means of elastically yielding support of the same in the mounting 15.

The elastic part 24 therefore also acts as the component for removably keeping the mounting 15 in the working position of the associated roller 104. This renders the construction extremely simple and therefore wear-resistant, as well as being functionally extremely convenient. The pivoting action of moving the pulling roller 104 away is performed by simply moving the mounting 15 against the action of the spring 24. After the web has been introduced, the unit returns automatically to the working configuration, both as regards the pulling rollers and as regards the drive belt 18, without requiring special means or operations.

Claims

1. Device for feeding webs of material alternately from two different reels, one a working reel (1) and the other a replacement reel (2), the two webs of material (101, 102), which may be, for example, paper, foil or the like, being guided from the associated reels (1, 2) to separate pulling units (4, 4'), one for each web of material (101, 102), which pulling units (4, 4') consist of pairs of cooperating pulling rollers (104, 204) rotating in opposite directions to advance the webs (101, 102) and between which the corresponding web of material (101, 102) is passed, characterized in that the contrarotating pulling rollers (104, 204) of each pulling unit (4, 4') of one web of material (101, 102) are driven simultaneously together by a common timing belt (18) engaging with a motorized pulley (19, M) and at the same time with respective drive pulleys (14, 17) integral in rotation with the corresponding pulling rollers (104, 204).
2. Device according to Claim 1, characterized in that one of the two pulling rollers (204) of each pulling unit (4, 4') is supported in a fixed position with respect to the web of material (101, 102), while the second pulling roller (104) is able to pivot between a working position, in which it presses against the first pulling roller (104) and the web of material (101, 102) is gripped between these with a predetermined force, in a position of angular distance, in particular about a hinge axis (16) that extends transversely relative to the axes of said pulling rollers (104, 204), and approximately parallel with the plane of travel of the corresponding web of material

(101, 102), the drive pulleys (14, 17) of the two pulling rollers (104, 204) being mounted on the corresponding ends of axial extensions (110, 111) of shafts (10, 11) supporting the two pulling rollers (104, 204), and the hinge axis (16) of the pivoting pulling roller (104) being located in the region of the extension (111) on which the drive pulley (17) is supported, in an intermediate position between the pulling roller (104) and said drive pulley (17).

3. Device according to Claim 2, characterized in that the axial extensions (110, 111) of the shafts (10, 11) on which the drive pulleys (14, 17) are mounted are of such a length, and the hinge axis (16) is in such a position relative to the longitudinal length of the shaft (11) and relative to the axial positions of the pulling rollers (104, 204) on their shafts (10, 11), that the difference between the compressive forces of the two pulling rollers (104, 204) at one end as compared with those at the other, that is between the compressive force furthest from and that nearest to the hinge axis (16), is less than the tolerances necessary for the correct compression for feeding the web of material (101, 102) between said pulling rollers (104, 204).

4. Device according to Claim 3, characterized in that the hinge axis (16) is in an intermediate position between the corresponding pulling roller (104) and the associated drive pulley (17) and in such a position, relative to the pulling roller (104) and the corresponding drive pulley (17), that when at a sufficient angular distance from the cooperating stationary first pulling rollers (204) to permit the introduction of the web of material (101, 102) between said rollers (104, 204), the angular displacement of the drive pulley (17) is minimal, i.e. can be absorbed by the intrinsic elastic deformability in the direction of twist about its axis of the timing belt (18), and by the position of the fulcrum of the hinge axis (16) (Fig. 5) relative to the way in which the belt (18) is wound (Fig. 4), without the belt coming off the angularly displaced drive pulley (17) or any separation of the teeth of said pulley (17) and of the timing belt (18).

5. Device according to Claim 4, characterized in that said hinge axis (16) is contained in a plane transverse to the axis of the shaft (11, 111), which plane intersects the drive pulley (17) transversely near the axially inward side of the pulley, while the hinge axis (16) extends along a tangent or secant of said drive pulley (17) and the hinge means (115, 21, 22) form a central recess (215) to accommodate the pulley (17) and to provide room for the drive belt (18).

6. Device according to Claim 5, characterized in that the hinge axis (16) is contained in a plane transverse to the axis of the drive pulley (17), and in particular one perpendicular thereto, which plane is

located near that longitudinal lateral edge (118) of the drive belt (18) which is closest to the associated pulling roller (104) or in which plane is contained said longitudinal lateral edge of the drive belt (18).

7. Device according to Claim 5 or 6, characterized in that the hinge axis (16) is at a radial distance from the axis of the drive pulley (17) which is between the external radius of the drive belt (18) passing around said pulley (17) and the radius of the depressions between the teeth of said drive pulley (17) or a radius slightly smaller than the latter and preferably a radial distance from the axis of the pulley (17) which is less than the internal radius of the drive belt (18) and/or of the teeth of said drive pulley (17).

8. Device according to one or more of Claims 2 to 5, characterized in that means are provided for regulating the mutual compression between the two pulling rollers (104, 204) of each pulling unit (4, 4'), which regulating means consist of an elastic part (24) which urges the two pulling rollers (104, 204) towards each other, especially in the radial direction of the rollers (104, 204), and they are located near those ends of the supporting shafts (10, 11) of said pulling rollers (104, 204) which are furthest from the ends on which the drive pulleys (14, 17) are supported.

9. Device according to Claim 8, characterized in that the means (24) for regulating the mutual compression between the pulling rollers (104, 204) simultaneously act as the means for removably locking them in the working position, the pivoting pulling roller (104) being moved angularly away from the stationary roller (204) by a simple movement against the action of said elastic means of mutual compression (24).

10. Device according to one or more of the previous claims, characterized in that the webs (101, 102) of the two separate reels (1, 2) are guided into a position of alignment in which they run one above the other and parallel with each other at a certain distance (9, 9') along at least terminal converging lengths (8, 8') of their paths, while a pulling unit (4, 4') for each web (101, 102) is located at a certain distance upstream of the angle where the paths (8, 8') converge with the parallel paths (9, 9'), the rollers (104, 204) of the pulling units (4, 4') having their axes aligned in planes transverse and perpendicular to the webs (101, 102) in the converging path (8, 8') and arranged symmetrically either side of the intermediate plane between the two converging lengths of the paths (8, 8').

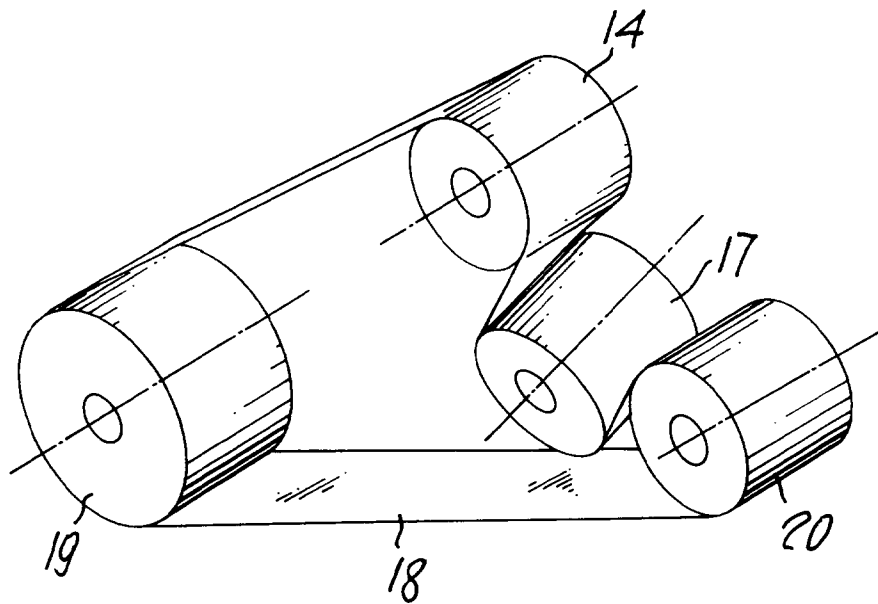
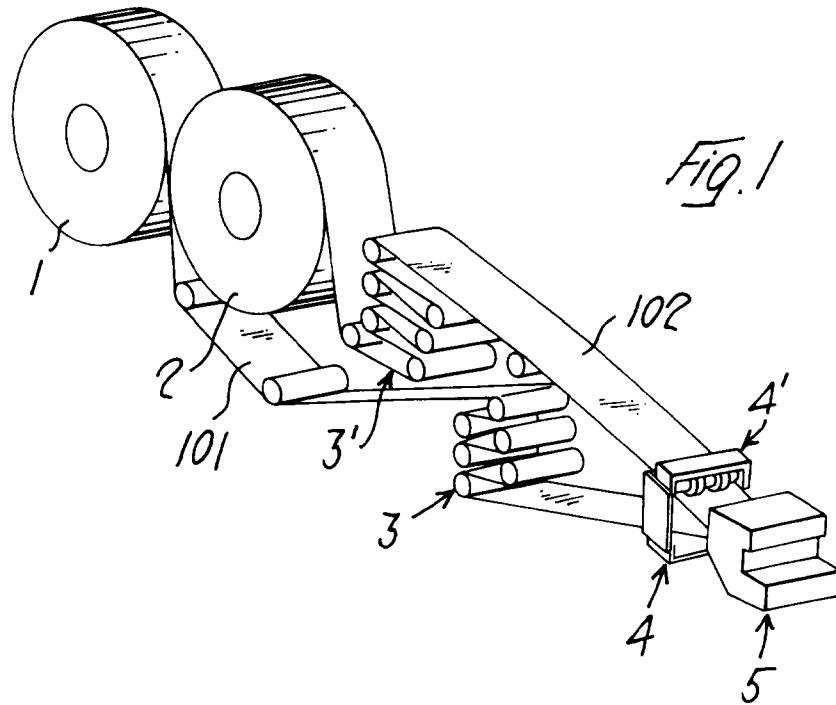
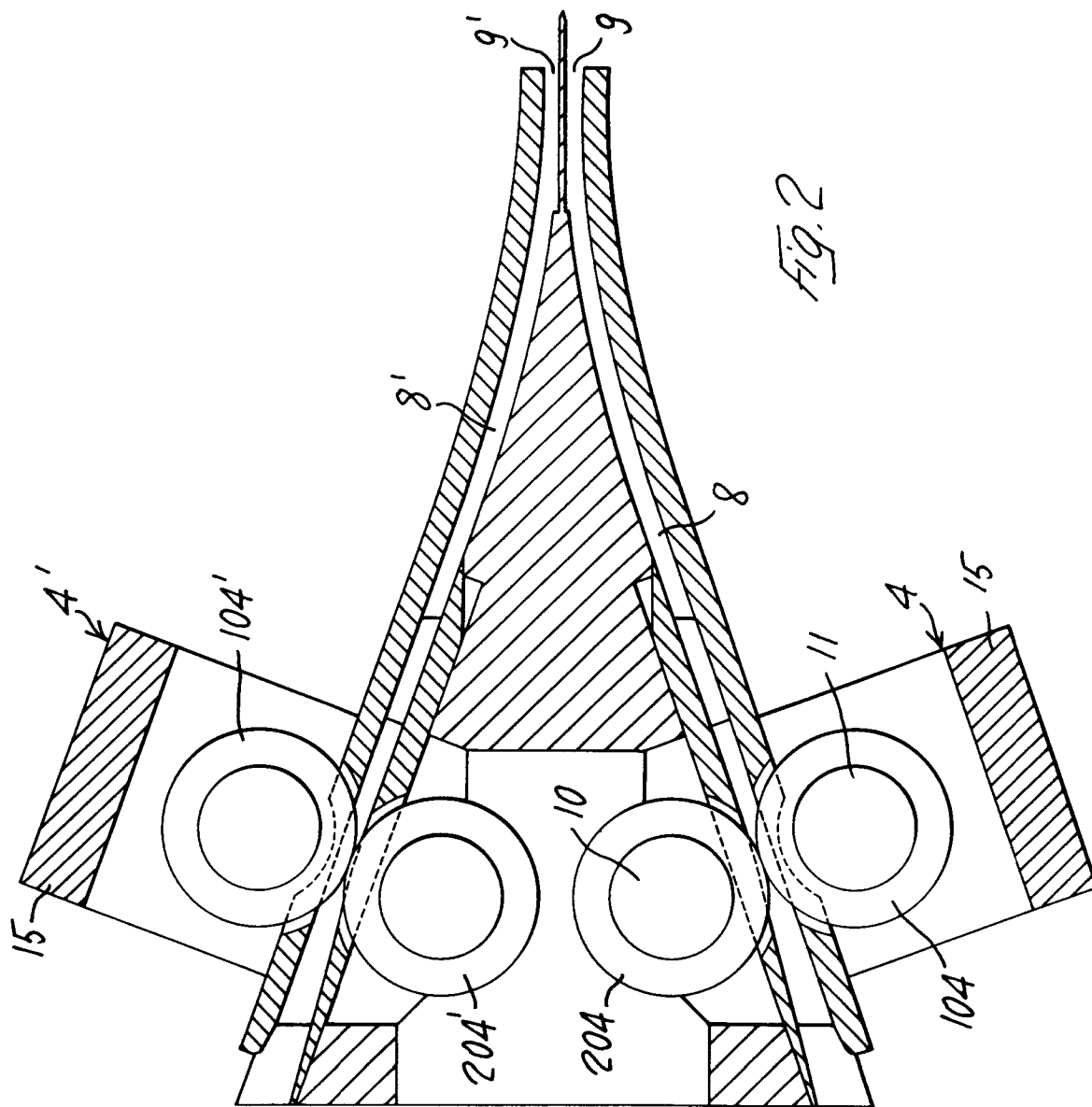
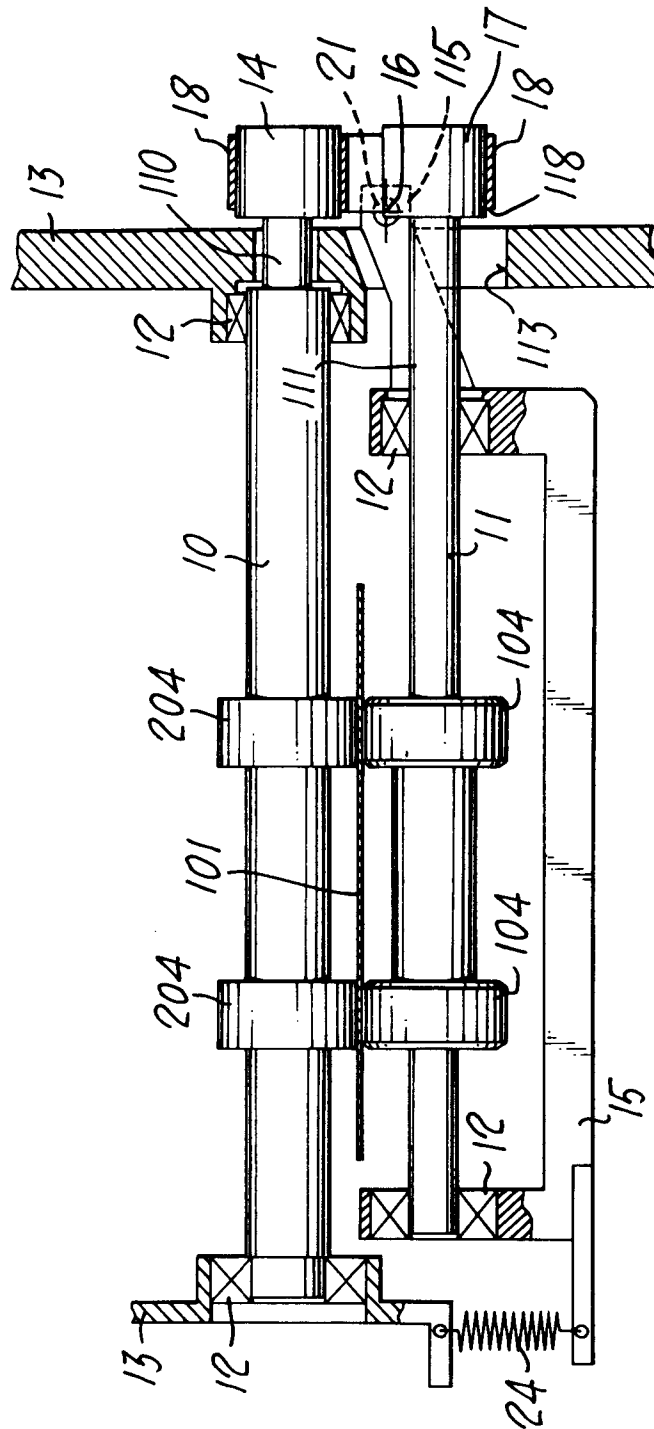
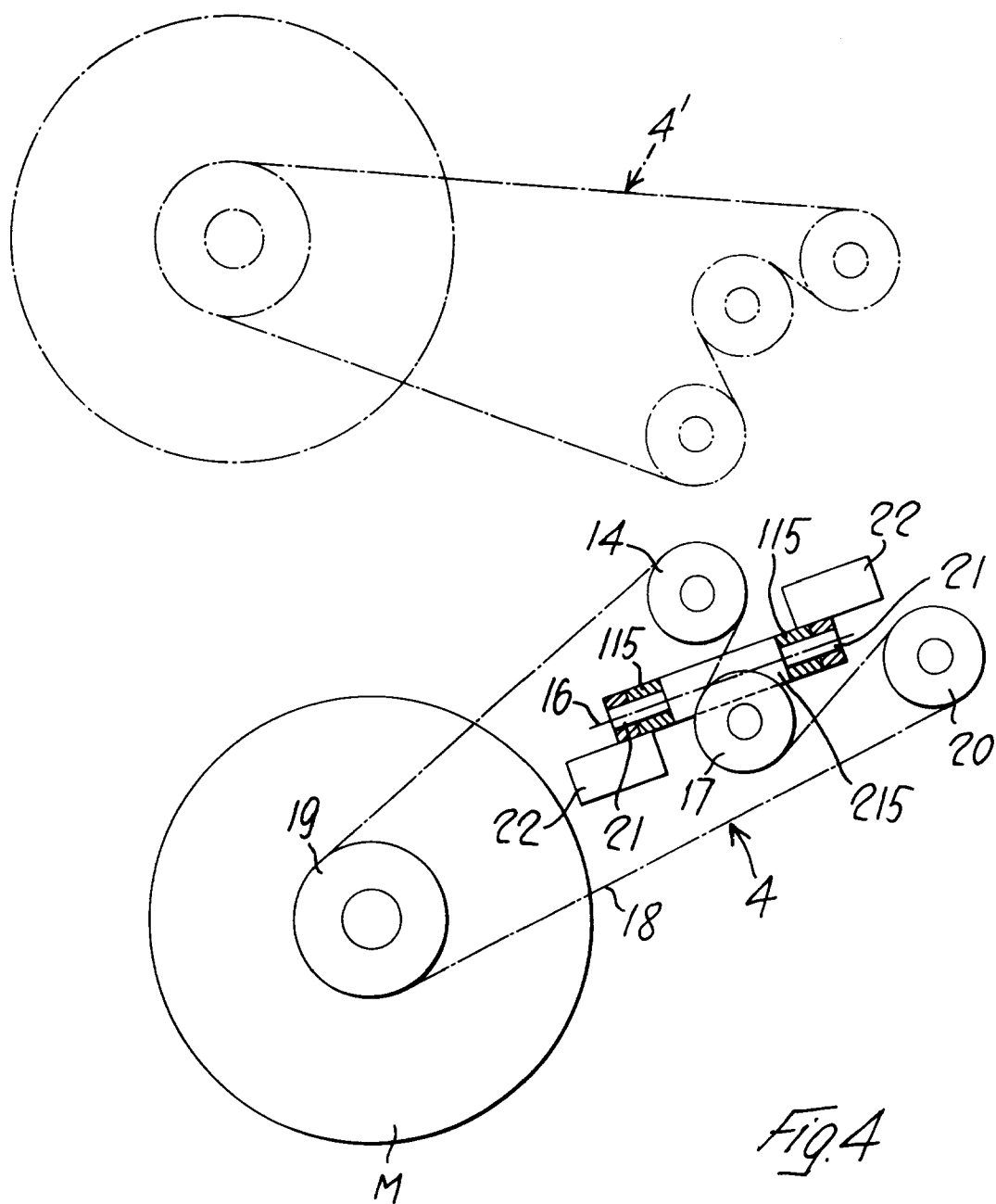


Fig. 6







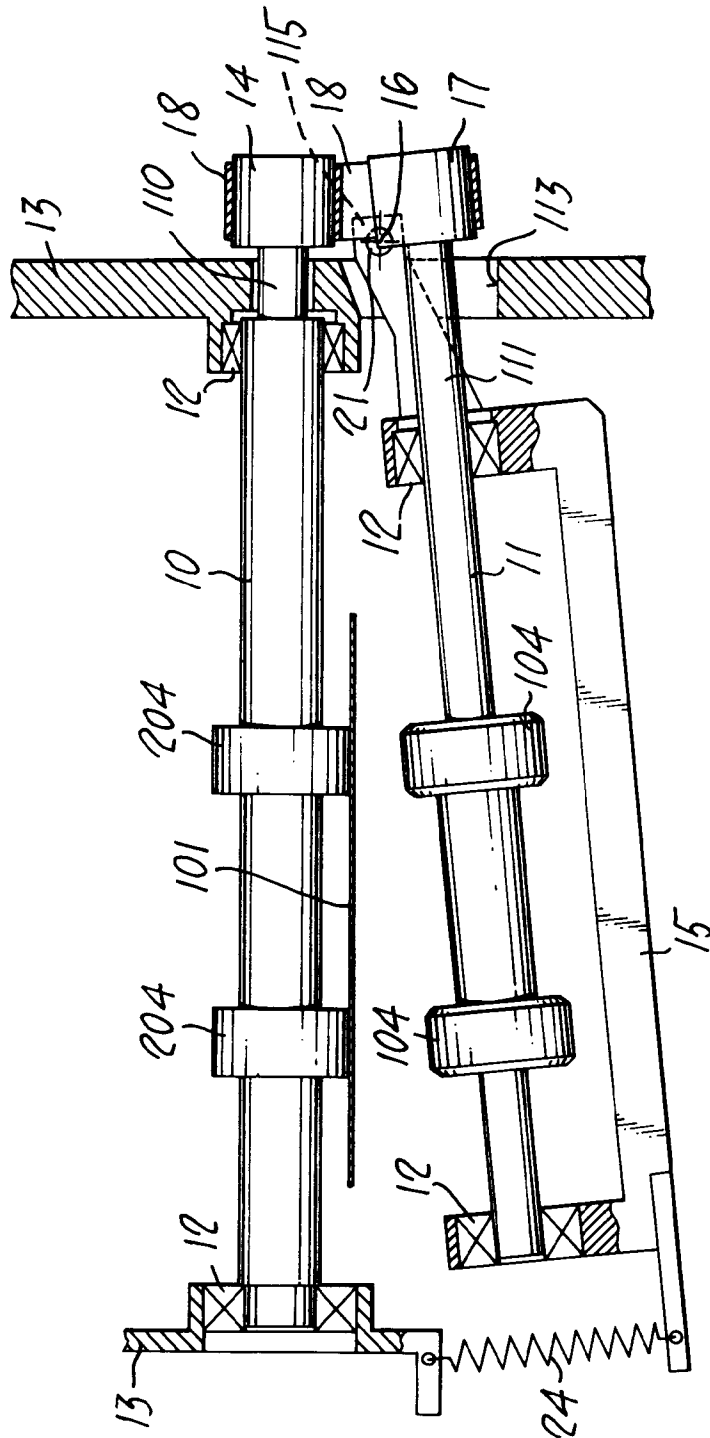


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 3359

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.6)
Y	GB-A-2 096 580 (SASIB SPA) 20 October 1982 * figure 1 * * page 1, line 67 - line 84 *	1	B65H19/10 B65H20/02
A	---	10	
Y	GB-A-2 188 037 (WINDMOLLER & HOLSCHER) 23 September 1987 * figure 1 * * page 2, line 43 - line 57 *	1	
A	---	2,8,9	
A	GB-A-2 119 764 (GENERAL ELECTRIC COMPANY, (USA-NEW YORK)) 23 November 1983 * the whole document *	2,8,9	
A	FR-A-2 592 866 (P. LE GALL) 17 July 1987 * the whole document *	1	
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A	US-A-3 945 262 (C. DE WITT GRIFFIN) 23 March 1976 -----		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 June 1996	Examiner Häusler, F.U.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			

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