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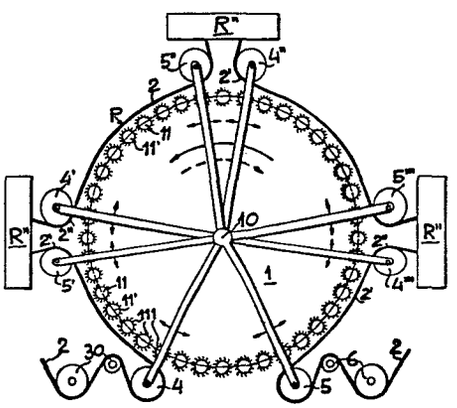
(54) **Process and means to optimize utilisation of drums of raising machines and the like.**

(57) An optimal utilization of raising working drums of raising machines and the like may be obtained when the fabric to be raised is put in touch of the raising drum (1) along an arch inferior to 290 degrees and particularly along an arch inferior to 180 degrees. In particular an utilization only of less than 180 degrees of the drum allows more than one raising working step, on the same raising machine and/or drum, which may be applied on different lengths of the same fabric (2) or different fabrics or both sides of the same fabric reversing the same with a fabric turnover device between first and second contact. With the arrangement according to the present invention it is possible even with only two series connected raising machines to comprise continuous raising working providing in a single passage through the raising machine a fabric raised on both sides.



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"Process and means to optimize utilization of operative surface of raising roller carrier drums of raising machines and the like"

This invention concern a process and means to optimize utilization of operative surface of raising roller carrier drums of raising machines and the like.

In the known art raising machines and the like are known comprising at least one drum including a number of raising rollers which are driven to rotate each about its axis and altogether around the axis of the drum as parts carried by the same. In satellitic position, attending upon such raising roller carrier drum a fabric intake roller and a fabric takeoff roller are provided with their axes parallel to the raising roller carrier drum axis so as to include a convex angle with vertex at the axis of raising roller carrier drum of about 290 degrees. Since the fabric length runs about intake roller, raising roller carrier drum and takeoff roller the fabric length engages the raising roller carrier drum along a 290 degrees arch which corresponds to the surface of raising roller carrier drum, whose raising rollers, comprised in such arch, keep into raising working engagement with the fabric loop being fed thereupon. Working effectiveness depends, among other factors, upon pressure urging the fabric upon the raising rollers and pressure, in turn, is a direct function of fabric feeding stretch and an inversed function of raising roller carrier drum diameter. Moreover such pressure is not constant all over the raising rollers engaged by the fabric. In fact raising working pressure is relatively low at the first raising roller, i.e. the one being closest to intake roller and thereafter increases up to a constant value which is maintained along an angle of about 120

degrees. Whereupon the pressure rapidly increases along the top central part of the fabric loop and then, simetrically to the increasing trend, decreases along next 120 degrees and at takeoff assumes the same value than at intake. Due to this unsteadiness of radial centripetal raising working pressure the raising roller carrier drum, its diameter cannot be designed smaller, while a true effectiveness of raising working take place only when pressure is comprised in a very strict optimal field. In fact, when lower pressures, as at fabric intake, and too much higher pressures, as in correspondance of the top of the fabric loop occur, the result is substantially null. Moreover, once that the fabric had been subjected to an excessive raising working pressure, e.g. at the top of the fabric loop or raising roller carrier drum, even with a following optimization thereof optimal efficiency is not restored. This proceding was generally ignored as the raising working result was accepted as a whole, without having care to analize where it, in fact, occurred. Once that the inventor's spirit of observation carried him, firstly to conceive and then to constate practically the steps of proceding, he realized two very important consequences: firstly fabric-raising drum contact in those sections of poor effectiveness is useless; secondly, from the same sections an optimal effectiveness may be obtained. Corollary to these perception followed: a) to recover the effectiveness lost in the second half of the drum by decreasing fabric feeding speed; b) fabrics to be raised on both sides may be alternately worked on both sides by optimally balancing pile raising. After having checked also these hypotheses he designed fabric takeoff from raising roller carrier drum where effectiveness become poor whereupon turning the fabric upside-down then reapproaching the same fabric by an additional intake roller to another section

position of same raising roller carrier drum. Particular and whole checking of these hypotheses carried the inventor to conceive new and novel raising machines and process by which with a single raising machine according to an embodiment of the present invention the same results obtainable from two known coupled raising machines may be obtained. Moreover with the embodiments of the invention many results may be obtained which are not obtainable from known raising machine or are obtainable only from complicated special raising machines or plants. Moreover the results are even more interesting when more than one embodiment of the present invention is included in one raising line.

For a better understanding of the present invention reference may now be made to the accompanying drawings which show a possible embodiment thereof in a diagrammatic and merely illustrative fashion.

Figure 1 is a skematic side view of a raising plant according to the present invention showing how, by an optimal utilization of effective section of a single raising roller carrier drum, a fabric lump of definite length arranged as a loop, is raised on both sides thereof.

Figure 2 is a skematic side view of a three raising machine raising plant according to the present invention showing how, by providing an optimal utilization of the effective surface of raising roller carrier drums, a fabric lump of indefinite length, is raised on both sides thereof.

Figure 3 is a skematic side view of a raising machine, according to the present invention, showing the driving transmission to drive, at variable speed the additional intake and takeoff rollers.

Figure 4 is a partricular perpective view showing a section of transmission shown at figure 3.

Figure 5 is a diagram showing in abscissa the flat developed circumference "L" of raising roller carrier drum or correspondingly the fabric length supposed to provide a loop about the whole raising roller carrier drum and in ordinate "P", representing the radial centripetal component power "P" urging the fabric against each raising roller of carrier drum in fact representing raising working pressure. Diagram is in the form of ordinate parallel arrows; thin arrow "C" representing conditions of known raising machines and thicker arrows "I" representing the corresponding conditions resulting from a raising machine according to the present invention. The diagram was determined analitically

Figure 6 is a diagram showing in abscissa time "T" and in ordinate the corresponding raising effectiveness "E". Area "V" marked with thicker lines or hatchings relating to known raising machines and area "I'" marked with thinner lines or hatchings relating to raising machines according to the present invention with a fabric feeding speed reduced by about 30% of speed of known raising machines. The diagram was determined with an experimental raising machine emboding the present invention wherein the takeoff roller was slowly rotated about the raising roller carrier drum axis from a position suitable for known raising machines to the intake roller checking and the effectiveness obtained at each rotating step. Approximately such experimental raising machine corresponds to the raising machine shown at figure 7 but including only two roller carrier arm: the first one (intake) and the last one (takeoff).

Figure 7 is a sketch of an improved raising machine according to the present invention, wherein four raising working sectors are provided whose size or angle may be adjusted according to the need and including tree fabric turnover devices meaning that about a single raising roller carrier drum four raising operations

dependent or independent of any kind may be provided.

Referring now to figures 1, 2 and 7 of the drawings, a known raising machine comprises substantially a raising roller carrier drum 1 which is rotatable about a drum shaft 10 and carrying on its substantially cylindrical periphery a number of raising rollers 11 and 11. Raising rollers 10 and 11 rotate in the same direction, each about its axis but each is provided with raising fillets whose teeth points are pointing in opposite direction referred to the raising fillet teeth point applied to the previous and next raising roller. The fabric lump to be worked, e.g. fed off from a beam (not shown) or from a chute 3, is run on a number of conveying rollers and finally wound about a portion of intake roller 4 placed almost tangent to the raising rollers 11, 11' of raising roller carrier drum 1 at a distance from its vertical axis substantially corresponding to about one half of the distance of its axis from drum axis 10. In the known machines the fabric lump 2 run upon the raising roller carrier drum 1 along an arch of about 290 degrees of its periphery and took off tangentially to the same raising roller carrier drum 1 and takeoff roller 5 to be received by output rollers 6. Then the fabric lump 2, partially worked on its side 2', could be worked on the same side by intaking the fabric lump in another machine (figure 3) as the one described of the same line comprising two (M2, M3) or more machines or the leading end of fabric lump 2 could be attached to the rear end of same to provide a loop to be run indefinitely completing the raising operation. This arrangement is shown in figure 1 and is such that the fabric lump 2 is carried again on the chute 3. Since operations to be executed on each side 2', 2" of the fabric lump are of at least two kinds, each including more runnings, one of which comprising the step so said "pile" according which the fabric lump 2, the

raising roller carrier drum 1, the raising rollers 11, 11' and the points are rotated or are pointed in one direction and the step so said counterpile according which at least one of the directions now described is inverted to be opposite to pile raising operation and vice versa. In known machine when both sides 2', 2" of fabric lump 2 were to be worked a four step operation was necessary which in case of on line plants could operate only with a number of machines resulting from the following relation:

$$\text{N of machines} = \frac{\text{N of sides or surfaces(pile runnings + counterpile runnings)}}{\text{N of leading ends changes}}$$

The same inventor and applicant with a previous application in Italy numbered 83639A/81 solved the problem of the number of leading end changes reducing them to one, i.e. the fabric lump are intaken row into the first machine M1 and outlet from the last plant machine. However this result was obtained encreasing correspondingly the number N of machines; since two steps are usually needed, the number of machines is to be duplicated.

Instead in case of provision of a fabric closed loop multiple revolution may be made so that the factor between brackets of the previous relation is reduced to unity so that the relation may be reduced to:

$$\text{N of machines} = \frac{\text{N of sides or surfaces}}{\text{N of leading end changes}}$$

From this relation results that for raising working a fabric lump on both sides without (testa-coda) step and with loop provision at least two machines are needed. Again in known machines the intake roller 4 and the takeoff both drive

the fabric lump 2 and their speed may be adjusted by a variator 40, 50 for each roller. Correspondingly adjusting the speed of rollers 4 and 5 a suitable stretch is provided on the fabric lump which in turn provide a centripetal radial pressure of fabric 2 against raising rollers 11, 11' representin the raising working pressure. From tis pressure depends the working effectiveness. Pressure P for known machine is shown at figure 5 by thin arrows C each of which represents a raising roller engaging the fabric 2 while effectiveness is represented by area C' marked with thick lines ascendin from left hand to right hand of diagram of figure 6.

According to the present invention, at least one additional takeoff roller 5' and preferably at least one additional intake roller are provided. Thus the same raising roller carrier drum may engage two or more surfaces of the same fabric lump or of more separate fabric lumps: as many as the pairs of intake-takeoff rollers. It will be appreciated that according to the present invention the previous relation are to be completed including at their denominator the number of roller pairs whose minimum value is of course 2 (figures 1, 2, 3, 5 and 6) thus the number of machines requested to make a given raising work is reduced at least to half. In fact, (figure 7) according to the present invention bigger raising roller carrier drums may be provided including four or more pairs of intake-takeoff rollers 4-5', 4'-5", 4"-5'" and 4'"-5. The raising working pressure P available at raising rollers 11 and 11' according to the present invention is shown in the diagram of figure 5 by thickened arrows which were determined analitically. Whereas the diagram of figure 6 showing surface C' relative to known machines which is marked with thick lines or hatchings drafted empirically, regarding the effect of present invention using a

machine with a satellite takeoff roller 5' which may be placed in any position about the periphery of raising roller carrier drum by adjusting at each experiment the angle formed with respect to intake roller 4 and raising roller carrier drum center. Diagram of figure 6 evidentiates that according to the present invention a substantially double effectiveness is obtained simply by reducing fabric feeding speed by 30% as is evident from a comparison of areas I' and C'. In fact it will be appreciated that area I' is twice as large as area C'. Thus at parity of time and number of machines an encrease of production by 65% is obtained. As shown in figures 1 and 3 of drawings when more than one surface of one or more fabric lump are to be worked, it is advisable to include between a pair of rollers and the next one e.g. between takeoff roller 5' of the first pair and intake roller 4' of second pair i.e. between rollers 5" and 4" and between rollers 5'" and 4'" a fabric turnover device R or R" or R'".

Thus is self explaining as (figure 7) again referring to previous relations or formulas that the number N of machines necessary to work a fabric 2 on both sides if the fabric lump is arranged as a loop and the machine takes advantage of invention described in Italian patent application 83639A/81 is reduced to:

$$N \text{ of machines} = \frac{\text{N. sides or surfaces}}{\text{N of leading end changes} \cdot \text{N pairs of rollers}} = \frac{2}{1.2} = 1$$

According to a a preferred embodiment of the present invention each intake roller 4' and each takeoff roller 5' is driven by the same variator 40' and 50' driving the partner roller of the pair. Since as known between each variator 50"

and 40" and the driven roller respectively 5, 4, a reduction gear 50, 40, are provided also between variators 50", 40" and rollers 4', 5' respectively, pendular reducing gears 40', 50' are provided. Pendular position of each reducing gear is adjustable by a device 7, 7', e.g. comprising a toothed segment 70, 70' a driving worm 71, 71', a driving rod 72, 72' and knob a 73, 73'. According to the same embodiment of the invention each pulley 74, 74' of pendular reducing gear and/or the one driving it through belt 58, 58' may be of the expandible kind so that the feeding speed of rollers 4', 5' may be changed about the speed rate of rollers 4 and 5 of the same pair.

C L A I M S

1. Process to optimize utilization utilization of raising roller carrier drums of raising machines and the like, characterized in that it comprise contacting offabric to be worked with a raising roller carrier drum along an angle at least inferior to 290 degrees and particularly inferior to 180 degrees and that the same raising roller carrier drum engages at one time at least two sides or surfaces of the same or different fabric lump.

2. Means adapted to realize the process as claimed in claim 1, characterized in that at least fabric takeoff roller which take off the fabric from raising roller carrier drum is placed or placeable so as to provide with respect to fabric intake roller an angle with vertex on raising roller carrier drum axis inferior to290 degrees.

3. Means, as claimed in claim 2, characterised in that the takeoff rollers are at least two and they are equal in number as the intake rollers.

4. Means, as claimed in claims 1 and 2, characterised in that at least one roller of each pair, comprising an intake roller and a takeoff roller, has its axis which can be revolutionized about theraising roller carrier drum axis.

5. Means, as claimed in claims 1, 2 and 3 characterised in that the feeding speed of each intake and takeoff roller associated is adjustable independently from speed of non associated rollers.

6. Means, as claimed in claims 3, 4 and 5, characterised in that between at least one takeoff roller of one pair and at least one intake roller of another pair is provided a fabric turnover device.

7. Means, as claimed in claims from 2 to 6, characterized in that they comprise rollers supports and the like to convey the fabric from the last takeoff roller

to the first intake roller of one or more raising machines in line to support a fabric continuous loop during its revolutions.

8. Means as claimed in claims from 2 to 7, characterized in that driving of eachintake or takeoff roller is taken from the same variator driving the associated takeoff or intake roller through a variator and a reducing gear.

9. Means as claimed in claim 8 characterized in that the reducing device is a pendular reducing device which is driven trough a a pulley in pendular arrangement the driving pulley being a an expandible pulley i.e. adjustable.

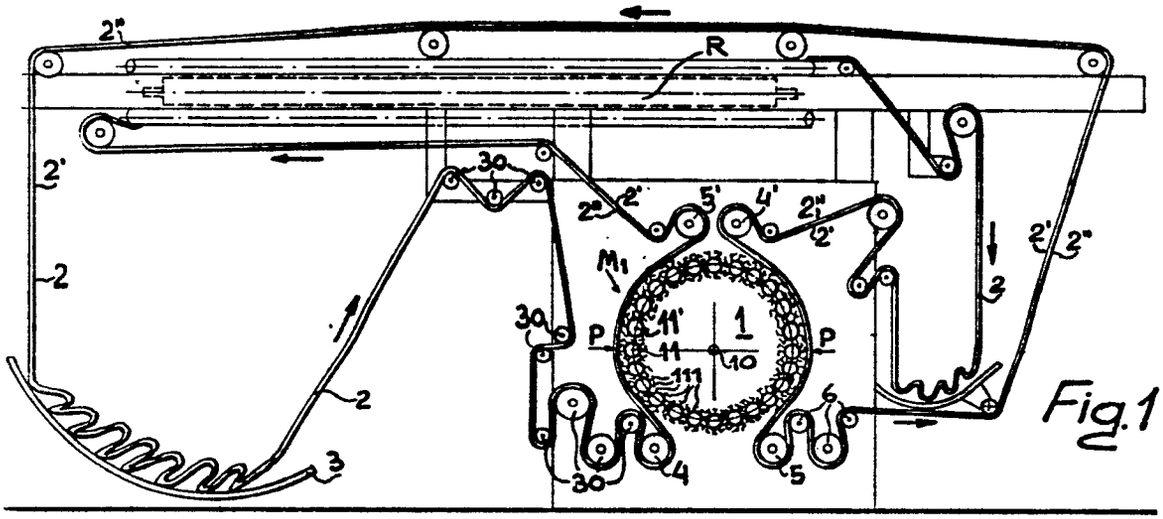


Fig.1

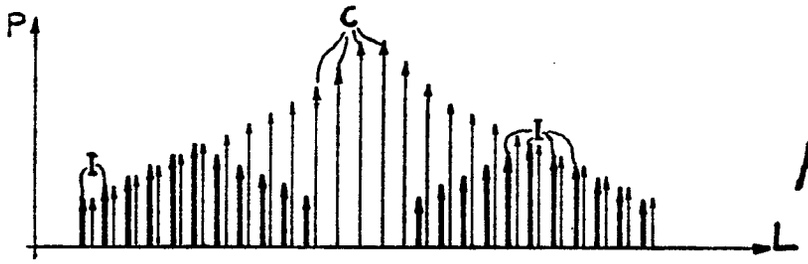


Fig.5

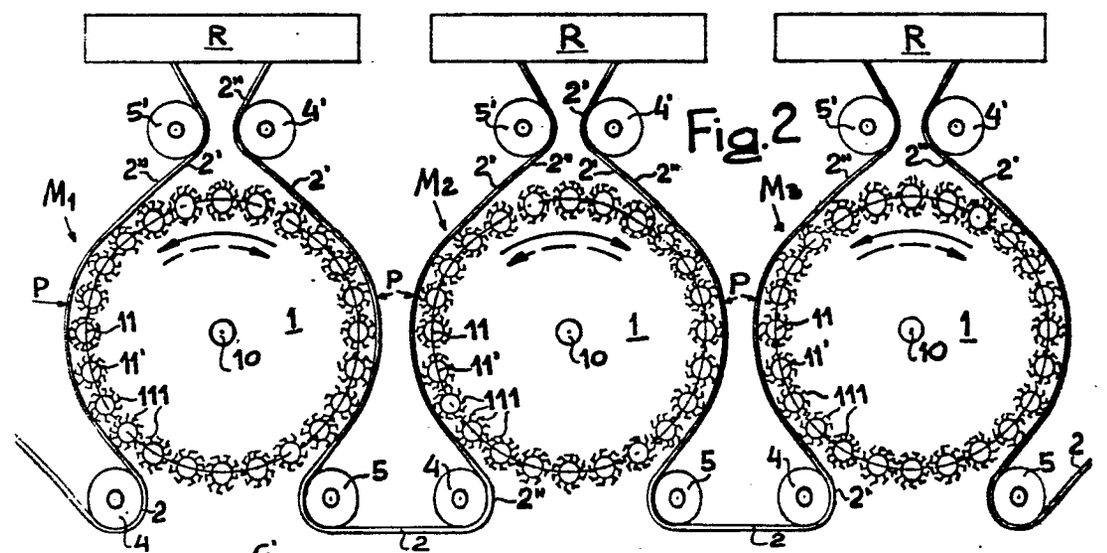


Fig.2

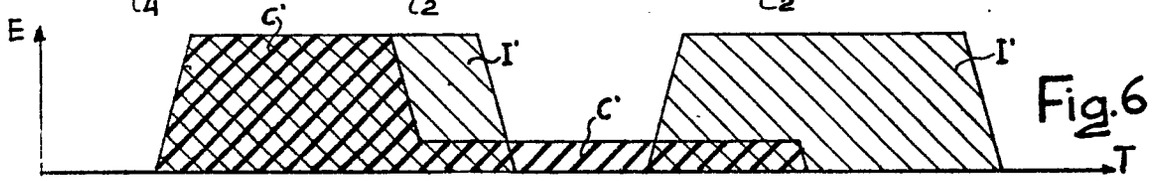


Fig.6

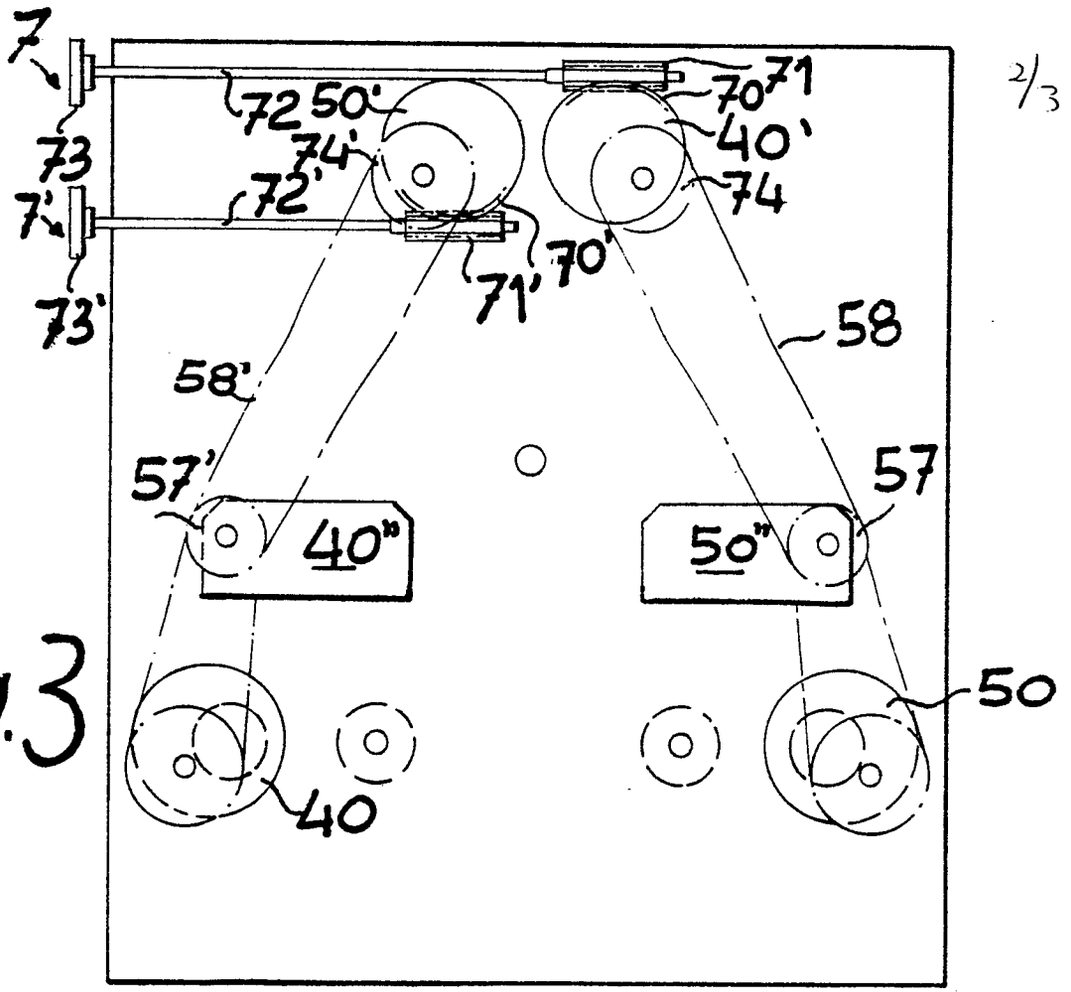

7
73
7'
73'
72
50'
74'
72'
71
70
40'
74
71'
70'
58
58'
57'
57
40"
50"
50
40

Fig.3

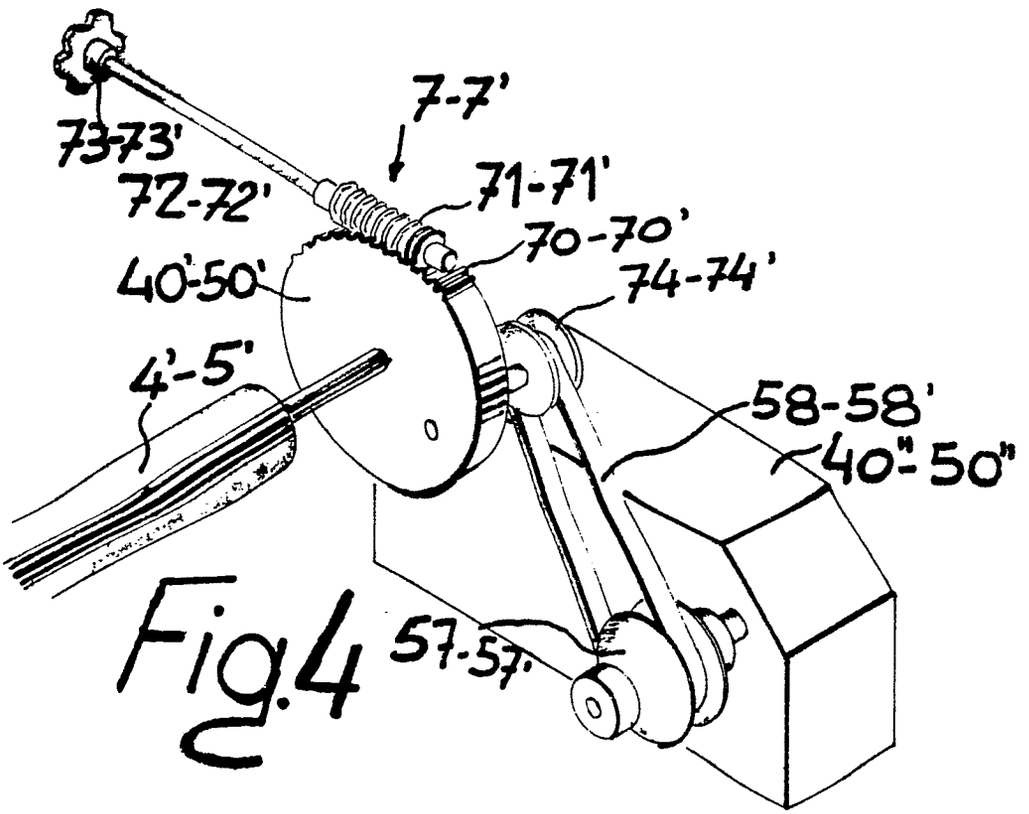
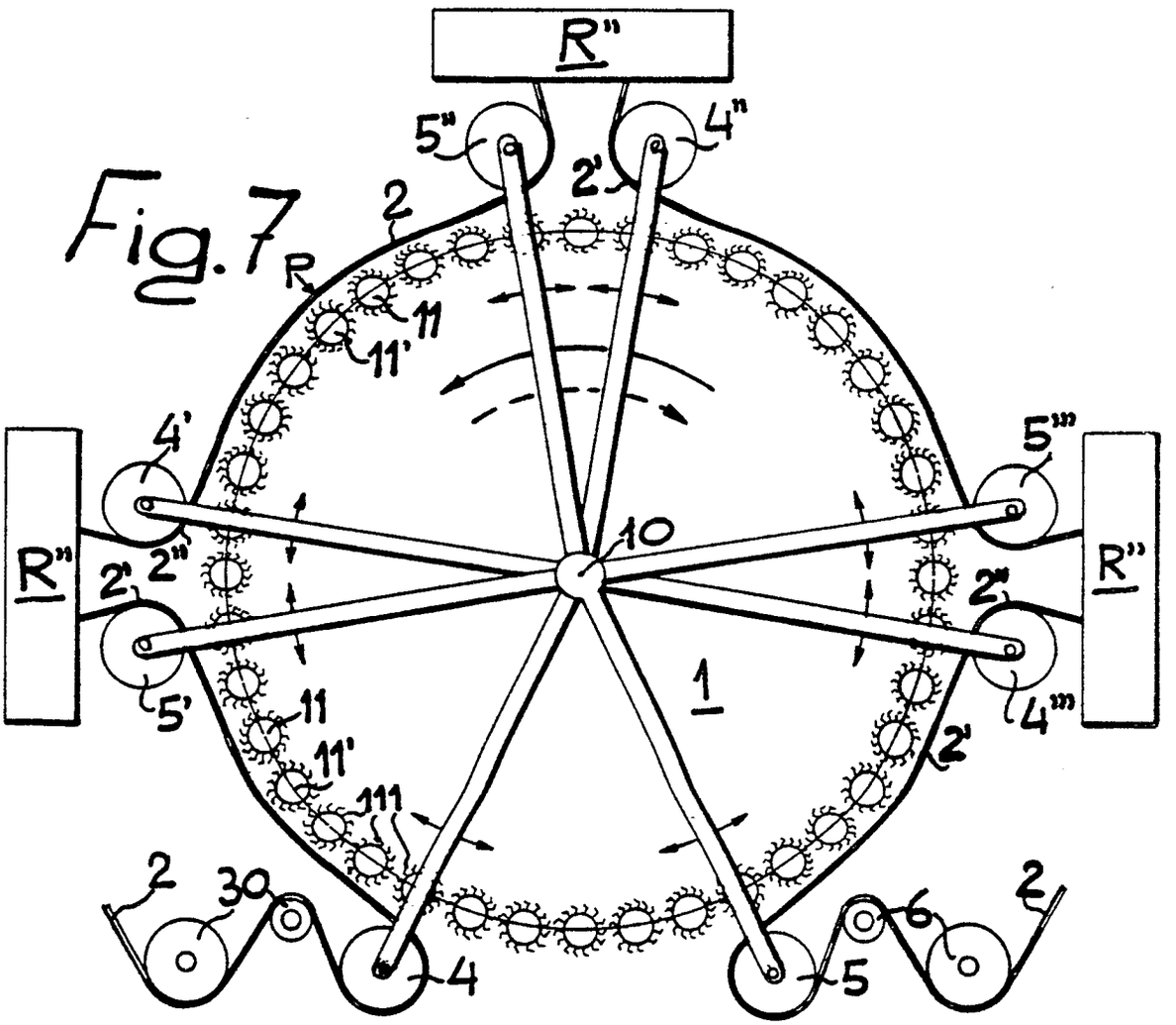

7-7'
73-73'
72-72'
71-71'
70-70'
40'-50'
74-74'
4'-5'
58-58'
40"-50"
57-57'

Fig.4

Fig. 7



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EUROPEAN SEARCH REPORT

Application number

EP 83 10 2269

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. ³)
X	GB-A-1 078 203 (GORDON ROBERTS) * Whole document *	1-4,7	D 06 C 11/00
X	US-A-3 822 447 (DANIEL FRISHMANN) * Figure 1 *	1-3	
A	FR-E- 89 593 (FRANZ MÜLLER) * Whole document *	1	
A	FR-A-1 163 662 (PELISSIER) * Whole document *	8,9	
A	GB-A-2 036 116 (DON DIONISIO TORRES)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			D 06 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16-06-1983	PETIT J.P.

CATEGORY OF CITED DOCUMENTS

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