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NEW ROLLING ROLLER DEVICES FOR WINDING MACHINE MECHANISMS

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High-quality winding of textile material (yarns) on bobbins affects not only the quality of the finished product, but also the reliability of the processing equipment. To regulate the packing density in the winding mechanisms of the rewinding machines, a device of a rolling roller is used, in which the rolling roller is movably mounted on a rigidly fixed axis in the rocker arm (Fig. 1 a).

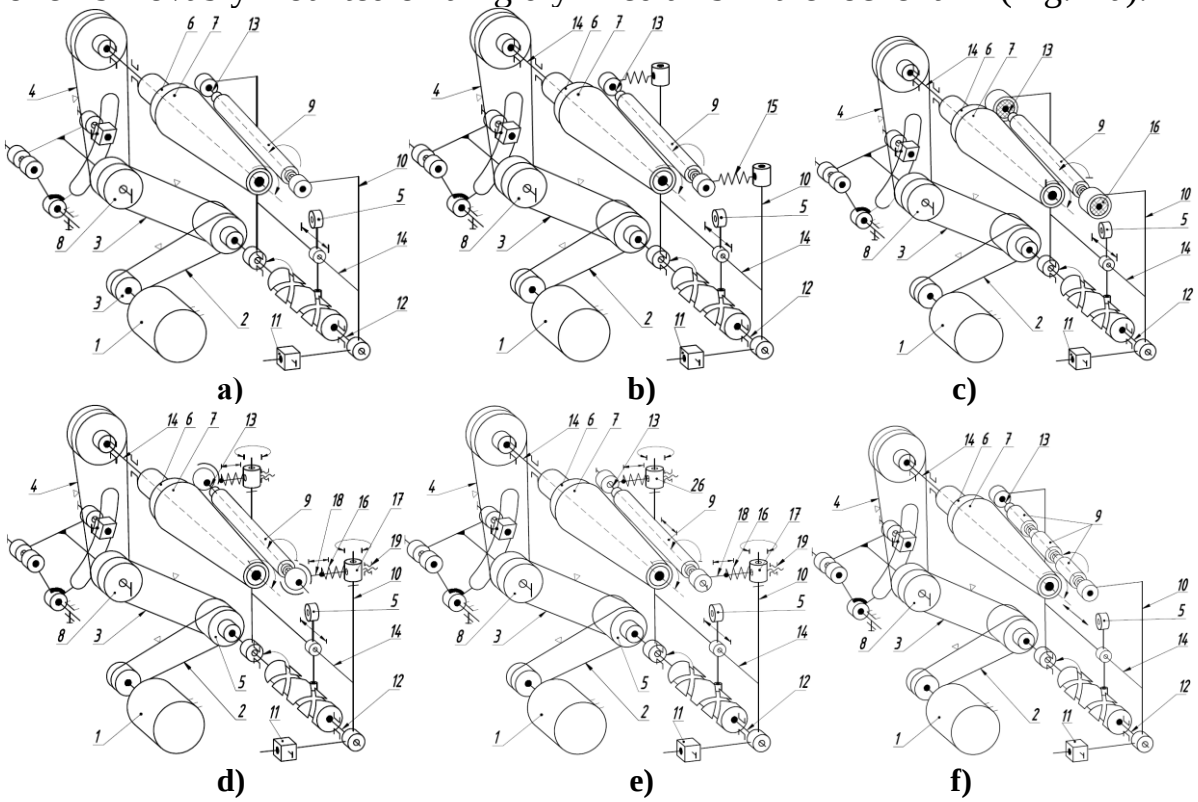

Fig. 1. Structures of mounting mechanisms of the rolling roller:
a - basic design; b - modification of M1 with spring-loaded rolling roller; C - modification of M2 with damping sleeves; d - modification of the M3 with the spherical connection of the rolling roller with the rocker arm elastic elements; e - modification of the M4 with a spring-loaded roller and connected by cylindrical kinematic pairs with a rocker arm; e - M5 modification with three rolling rollers. 1 - electric drive; 2-4 - belt transfers; 5 - mechanism of the distributor; 6 - mechanism of the bobbin holder; 7 - reel; 8 - tension pulley; 9 - a rolling roller; 10 - rocker arm; 11 - counterweight; 12 - shaft; 13 - axis; 14 - guide; 15 - spring; 16 - rubber sleeve; 17 - cylindrical finger; 18 - shock absorber stem; 19 - nut.

The advantage of this mechanism is a simplicity in the design of the roller, which reduces the cost of equipment. However, the typical design of the

device of the rolling roller has significant drawbacks - rigid fixing of the rolling roller does not provide damping of vibrations resulting from the rotation of the bobbin, and also leads to uneven clamping of the bobbin with packaging over the entire length of the material. 1, 2]. New devices for the rolling roller of modifications M1-M5 [3-7] are shown in fig. 1, b-e. All devices except the M5 come with different shock absorber designs. All shock absorbers have design advantages, so in modifications M1-2 design have a simple design solution, unlike modifications M3-4 in which the design still provides contact rolling roller parallel to the axis of rotation of the reel. The device of the rolling roller of modification M5 (Fig. 1, e) has an approximate structure of the basic variant (Fig. 1a). Figure 2 shows the calculation of the natural oscillation frequencies of the rocker arm with rigid fastening 1 and the fastening of the rolling roller 2-5.

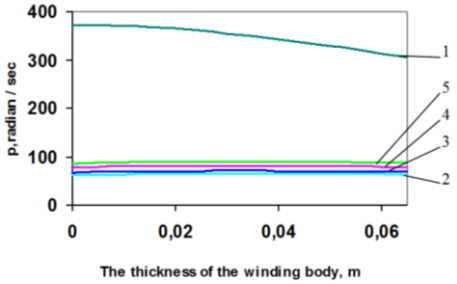

Fig. 2 - Dependence of the natural frequency of oscillation of the rocker arm: 1 - with rigid fastening of the axis of the rolling roller in the rocker arm; 2($Cp1=5\cdot10^3$ Н·м$^{-1}$), 3($Cp2=6\cdot10^3$ Н·м$^{-1}$), 4($Cp3=8\cdot10^3$ Н·м$^{-1}$), 5($Cp4=1\cdot10^4$ Н·м$^{-1}$) – when elastic connection of the rolling roller with the rocker arm.

The proposed structures in comparison with the basic mechanism allow for the expense of the shock absorber to reduce the natural oscillation frequencies of the rocker, which allows to increase the working speed of the winding mechanism. Also developed mechanisms allow to reduce the dynamic load on the winding mechanism, which leads to increased speed and reduced vibration during rewinding.

References

1. Фишман К.Е. Производство волокна капрон / К.Е. Фишман, Н.А. Хрузин. – Москва : Химия, 1976. – 312 с.

2. Коритысский Я.И. Динамика упругих систем текстильных машин / Я.И. Коритысский. – Москва : Легкая и пищевая пром-сть, 1982. – 272 с.

3. Пристрій для намотування нитки у бобіни : пат. 136673 Україна : МПК(2006) B65H 54/00. № u201902864; заявл. 22.03.2019 ; опубл. 27.08.2019, Бюл. № 16.

4. Пристрій для намотування нитки у бобіни : пат. 136674 Україна : МПК(2006) B65H 54/00. № u201902866; заявл. 22.03.2019 ; опубл. 27.08.2019, Бюл. № 16.

5. Заявка U. 2019 03356 приоритет від 03.04.12

6. Пристрій для намотування нитки у бобіни : пат. 13677 Україна : МПК(2006) B65H 54/00. № u201903355; заявл. 03.04.2019 ; опубл. 27.08.2019, Бюл. № 16.

7. Пристрій для намотування нитки у бобіни : пат. 136735 Україна : МПК(2006) B65H 54/00. № u201903353; заявл. 03.04.2019 ; опубл. 27.08.2019, Бюл. № 16.