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Meyer

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[54] **APPARATUS FOR DEPOSITING ELONGATED, FLEXIBLE MATERIAL**

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[51] **Int. Cl.** **B65h 47/14**

[58] **Field of Search** 242/82, 83

[56] **References Cited**

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2,991,956	7/1961	Bruestle	242/82
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3,093,339	6/1963	Godderidge	242/82

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Assistant Examiner—Edward J. McCarthy
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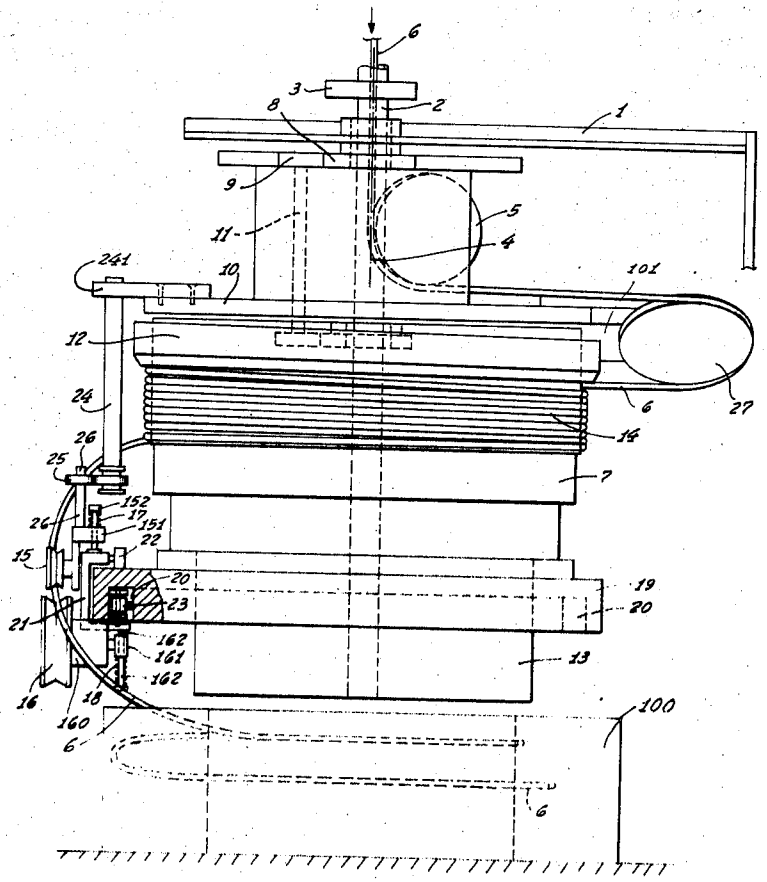
[57] **ABSTRACT**

An apparatus for depositing elongated, flexible material in a container and including a drum, a revolving coiling head for sequentially winding loops of the material onto the drum, and means for pushing the loops axially down for the respective lowest loop to drop into the container; a pair of pulleys is disposed on a holder revolving about the drum in synchronism with the coiling head; the pulleys grip the material of the dropping loop and at least one of the pulleys runs at a peripheral speed faster than the pay-in speed of the elongated material; the holder runs in an excentrical, closed-loop, revolving track so that the material is deposited in the container in rosetta-shaped pattern.

5 Claims, 2 Drawing Figures



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SHEET 1 OF 2

Fig. 1

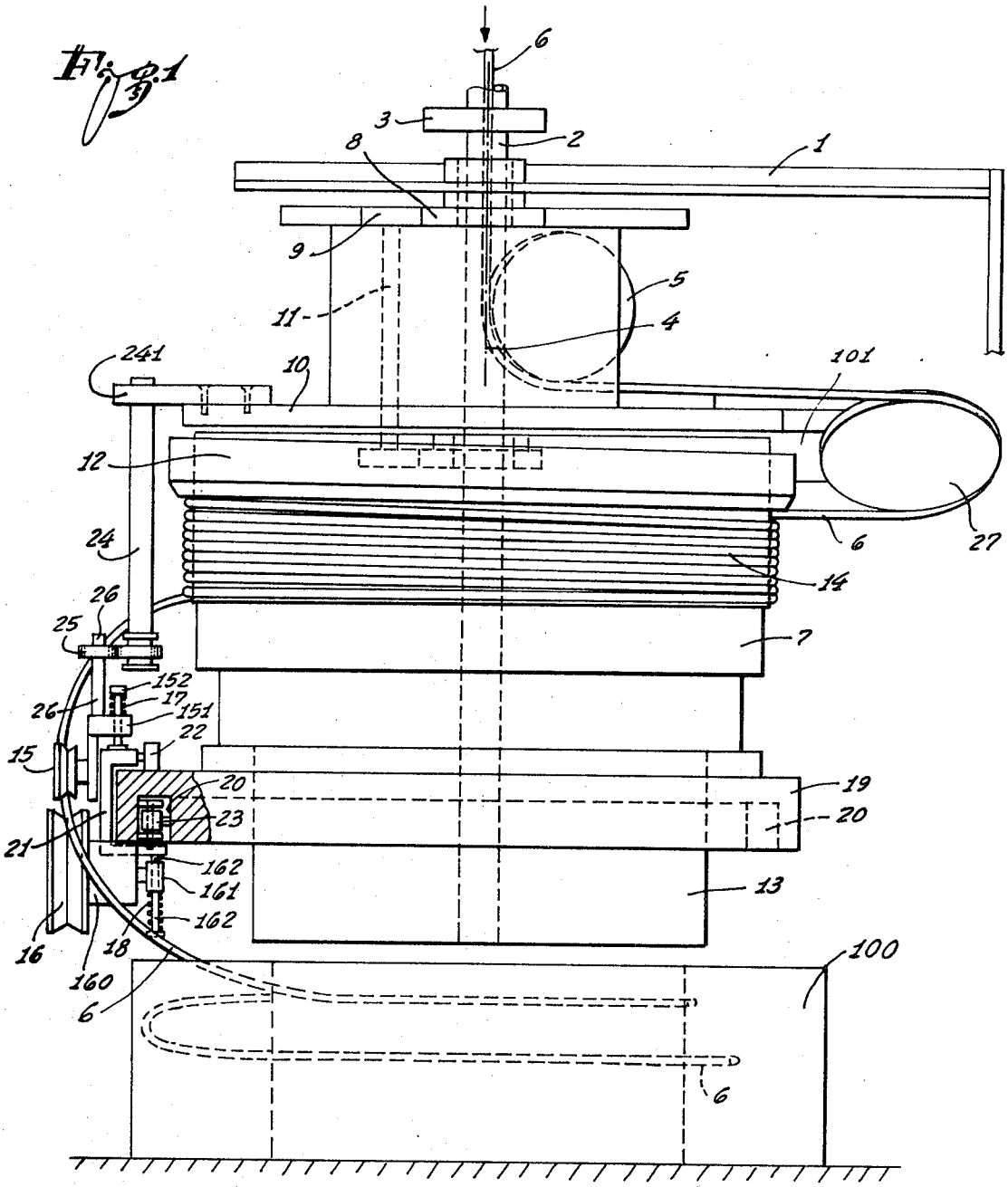

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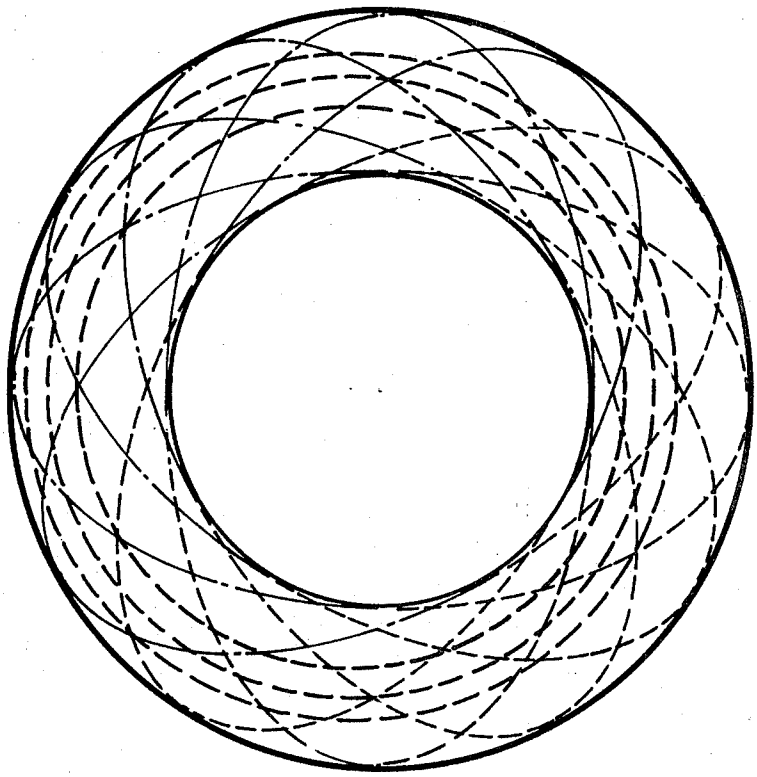
Fig. 2



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APPARATUS FOR DEPOSITING ELONGATED, FLEXIBLE MATERIAL

BACKGROUND OF THE INVENTION

The present invention relates to a coiler for depositing elongated flexible material such as bare or coated wires, or strands of wires into a barrel-like container; more particularly, the invention relates to a coiler which deposits such material in a rosetta-shaped configuration, layer upon layer, in a suitable container.

French Patent No. 1,237,747, corresponding approximately to U. S. Pat. No. 3,093,339 discloses a coiler wherein wire is wound upon a drum by means of a winding or coiling head. The drum has configuration of a horizontally disposed disc, and the coiling head deposits loop above loop onto the periphery of that drum or disc. The loops are progressively pushed down so that the respective lowest loop drops into a barrel. The downshifting of the loops, resulting ultimately in the dropping of the lowest one is carried out in the apparatus disclosed in the above-mentioned patents by means of a wobble ring which rotates in synchronism with the coiler head to shift the individual loops along the periphery of the drum, in axial (vertical) direction thereof.

In the alternative, it is possible in cases that the loop that is just being wound onto the drum exerts axial pressure upon the remaining loops, shifting them in down direction, so that the respective lowermost loop will in fact drop into the barrel. It is evident that a barrel that is being filled in such a manner with coiled material has to be replaced by an empty one when filled. Therefore, it is important to actually fill such a container with material as much as possible. It is, of course, important to make sure that the coiled material can be removed subsequently from the barrel without damage.

In German Patent No. 1,031,252, it is suggested to provide a deflecting member which is, so to speak, in the way of a dropping loop and which rotates slowly (slower than the coiling head). As a consequence, of such deflection, the respective dropping loop obtains a preferred direction of extension, as far as loop configuration is concerned, i.e., it is eliptically distorted. It is a consequence of the rotation of the deflecting member that the loops which drop progressively downward undergo an angular precession or phase shift as to eliptical orientation and that in turn results in a rosetta-shaped configuration. U. S. Pat. No. 2,991956 is likewise of interest in this respect.

Generally, it can be said that the number of revolutions of the coiling head determines the number of loops per unit time that are deposited in the barrel; the considerably lower speed of rotation of the deflecting member determines the angular precession, i.e. the phase shift among the rosetta or elipse peaks, around the axis.

The coilers operate properly as long as the bare or coated wires are free from torsional strain. However, the particular processing of the wire prior to coiling may extert torsional stress. Torsion is particularly prevelant if the elongated material to be coiled is actually stranded or twisted or otherwise intertwined. Even if stranded wires are jacketed, for example, by a shield or the like, they still are not free from torsional strain. As a consequence, the loops, upon dropping, do not retain the particular loop configuration 9Particularly as far as elipse orientation is concerned). They may be

twisted in the process which may cause kinking or other damaging to the strand. Also, such torsion will distrub the regular pattern of depositing the loops in a barrel so that the wires may be damaged for that reason. Even if there is no damage, such additional twisting may impede, even block the material when withdrawn from the barrel during further processing.

DESCRIPTION OF THE INVENTION

It is an object of the present invention to provide a coiler for depositing loops of elongated, flexible material into a barrel which is free from the deficiencies mentioned above and which operates properly even if there is internal torsional tension in the material to be coiled and deposited. In particular, it is an object of the present invention to provide improvement of a coiler in which elongated, flexible material is deposited in rosetta-shaped configuration in a barrel whereby a revolving head winds loops sequentially upon a horizontal drum from which the respective lowest loops drops into a barrel.

In accordance with the preferred embodiment of the present invention, a pair of pulleys is provided to serve as a slowly revolving deflecting member, whereby at least one pulley is driven so that its circumferential speed is larger than the propagation or pay-in speed of the elongated material as it enters the coiler. The pair of pulleys is guided along a track at a revolving speed equal to the revolving speed of the coiling head, but the track has excentric position to the axis of the drum and revolves by itself about the axis; preferably that track is a circular one with an off-center position.

While it is possible to have a separate drive for this pair of pulleys it is of advantage to have one or both pulleys driven by means of frictional engagement; for example, with the slowly revolving track. The carriage and holder for the pulleys may be driven by separate drive; however, it is simpler and equally suitable to couple the carriage and holder to the revolving coiling head. This is particularly carried out by having the holder for the pair of pulleys linked pivotably to the arm that carries the coiling head to offset the excentricity of the pulley or the holder. This way the pair of pulleys will indeed follow the circular track as it is excentrically positioned in relation to the axis of the drum, and synchronization with the coupling process is insured.

DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawings in which:

FIG. 1 illustrates a side elevation of a coiler constructed in accordance with the preferred embodiment of the present invention; and

FIG. 2 shows somewhat schematically a resulting loop pattern in a barrel in which the coiler deposit the several loops of elongated material.

Proceeding now to the detailed description of the drawing, in FIG. 1 thereof is illustrated a stand or frame 1 journalling a hollow shaft 2. The shaft 2 is driven by means of a drive that is not illustrated but engages a

gear 3 on the shaft. Hollow shaft 2 has a slot 4, and a first guide pulley 5 extends partially into that slot. Pulley 5 has a horizontally oriented axis, and the position of the guide pulley is elected so that the axis of shaft 2 is tangent to the periphery of pulley 5. Elongated, flexible material, such as bare or coated wire 6 runs into the hollow shaft 2 as is, for example, shown in U.S. Pat. No. 3,360,212 and propagates axially in the interior of hollow shaft 2 until being deflected from the axis in horizontal direction by operation of pulley 5. The elongated material runs towards an obliquely positioned second guide pulley 27 pertaining to the coiling head. The revolving coiler proper includes a circumferential housing 10 that is positively connected to shaft 2 and rotates therewith.

The housing 10 supports the obliquely positioned pulley 27, i.e. that pulley is journalled for free rotation, on an arm 101 that extends from housing 10. In addition, housing 10 includes bearings for a shaft 11 that is disposed eccentrically to the axis of hollow shaft 2. Shaft 11 carries a pinion 9 that meshes in statinary pinion 8, pinion 8 being mounted on frame 1 and being stationary accordingly. Therefore, upon rotation of housing 10, shaft 11 revolves about the common axis of housing 10 and shaft 2. Since pinion 9 meshes stationary pinion 8, the shaft 11 (1) revolves around the axis of shaft 2 and (2) rotates about its own axis.

A drum 7 is provided to receive the loops of elongated material as the coiling pulley 27 revolves about the axis of shaft 2. The drum 7 is provided as a hollow element and is rotatably positioned on shaft 2. In the interior of hollow drum 7 there is, for example, provided gearing of the type disclosed in the above-identified corresponding U. S. and French patents, that gearing cooperates with the pair of pinions 8 and 9, and shaft 11 actually causes the drum 7 to remain dynamically stationary.

A wobble ring 12 is provided which can likewise be constructed as is taught in the above-identified three patents. The wobble ring rotates about the system axis and causes loops 14 as they are wound upon the periphery of the drum to be pushed down, so that free winding space is always available on the periphery of drum 7 for receiving another loop of stranded material as it runs off pulley 27. In addition, hollow drum 7 includes a planetary gear for driving a drum 13 which is coaxial to the several elements mentioned above (axis of shaft 2) and which is relatively suspended from drum 7. Drum 13 serves as a spacer for the dropping loops.

It is pointed out that the component as described thus far actually represents essentially the state of the art. The state of the art includes also a deflecting member that reaches into the path of the dropping loops, such as disclosed, for example, in the German Patent No. 1,031,252. (See also co-pending application No. 155,804). However, the particular construction of the deflection member, as disclosed in this specification, is the novel aspect of the invention.

The immediate dropping of the loops off the drum itself is the same as in known coilers. However, in accordance with the particular invention, a dropping loop does not fall freely, but the string of material is guided by a pair of pulleys 15 and 16. A spring 17 urges pulley 15 towards pulley 16; a holder 21 is provided and having a post 152, traversing a bore in a mount 151 and carrying spring 17. The mount 151 is suspended from the post by the spring 17, which urges the mount in down direction. Pulley 15 is journalled on an arm that extends from mount 151.

As to the second pulley 16, a post 162 extends from holder 21 and traverses a bore in a mount 161. A spring 18 is interposed to urge mount 161 in up direction. The pulley 16 is journalled on the mount. A traction roller 160 is coupled to pulley 16 and serves as drive thereof. The traction roller 160 runs on a surface of a disc 19 that is mounted on drum 13. The two pulleys 15 and 16 have grooved periphery to positively engage the elongated, flexible material 6 as it passes through.

As stated, at least one of the two pulleys 15 and 16 is driven, namely pulley 16. The peripheral speed imparted upon pulley 16 by traction roller 160 is larger than the speed of the material that passes the duct established by the grooves on pulleys 15 and 16. This excess speed of the pulley causes exertion of a pulling force upon the elongated material as it runs off drum 7. Also, engagement of the material by faster moving pulley or pulleys establishes an exact definition of the point from which the material is permitted to drop freely, and that in turn suppresses the effect of internal torsion in the elongated, flexible material. As a consequence, the material drops freely into the barrel or other suitable container 100.

In accordance with another feature of the invention, cylindrical body 13 is drivingly geared to shaft 2 and drum 7 so that it is provided with a very low speed, i.e., it revolves at a very low speed. Disc member 19, as carried by drum 13 is provided with a circular groove 20. The circular groove 20 is disposed eccentric to the common axis of the system, i.e. the groove 20 extends eccentric to shaft 2.

Holder 21 for the pair of pulleys 15 and 16 is provided with a roll 22 that engages the top of disc 19 and runs thereon. Holder 21 in addition is provided with a carriage-like construction 23 that guides the holder and the pair of pulleys along the circular track 20.

It should be noted that thus far three different rolling methods have been introduced. First, by frictional engagement between roller 160 the downwadly directed surface of disc 19 roller 160 (and thereby pulley 16) is caused to roll, provided there is relative movement between the disc and holder 21. Second, in the case of such movement, the carriage 23 has rolls that move in track 20 and thereby the holder 21 and the pulleys are forced to follow an eccentric path around the system's axis. Third, roll 22 rolls on top of disc 19 for rolling support thereon. That roll could be coupled to pulley 15 to impart rolling motion thereto. All these rolling motions presume that holder 21 is by itself driven by revolve about shaft 12, and to the generation of that driving motion I now turn.

A bolt or pin 24 extends from an arm 241 which in turn extends from housing 10. A lever extends horizontally from the lower end of pin 24 and is freely pivotable on the pin. A guide post 26 extends from mount 151 and is received by an aperture in the end of lever 25. Actually then this arrangement 24, 25 and 26 drags the holder 21 in accordance with the rotation of the coiler head assembly while the carriage 23 determines the eccentricity and radial distance of the carriage from the axis of shaft in any instant.

It can readily be seen that as a consequence of the invention there is always the same length of the material 6 between the pulley 27 on one hand, and the pulley pair 15 and 16, so that the number of loops 14 on the

drum and the total length thereof is always constant. The elongated material **6** is subjected to a particular tension which is basically determined by the peripheral speed of the coiler head (that is the pay-in speed of material **6**) on one hand, and the peripheral speed of pulleys **15** and **16** on the other hand.

Of course, additional pulleys for guiding material **6**, etc. can be provided. For example, auxiliary pulleys may urge the loops **14** onto the periphery of drum **7**. Also, pulleys may be provided which support and guide the axial advance of the several loops in down direction along the periphery of drum **7**. Still additional pulleys, for example, may be arranged in pairs and positioned to engage the material along the path from the drum to the particular pair of pulleys **15** and **16** so as to support the material portion from its dropping off the drum, up to the point of engagement with the particular pair of torsioning pulleys **15** and **16**.

In the particular example illustrated, pulley **16** is driven through frictional engagement of roller **160** with disc **19**. That disc rotates quite slowly as compared with the revolving speed of coiler and deflection assembly (**15, 16, 21**, etc.). The diameter of roller **160** determines the number of revolutions of the pulley, and that in turn determines its peripheral speed to follow the rule outlined above. The number of loops deposited into the container **100** per unit time is determined basically by the revolving speed of coiler and pulley pair **15–16**. The angular precesion of the rosettas as deposited in container **18** is determined by the speed reduction imparted upon cylinder **13** which determines the slow rotational speed of disc **19** and that in turn determines the speed with which the eccentrical track **20** revolves about the axis of shaft **2**.

The invention is not limited to the embodiments described above but all changes and modifications thereof not constituting departures from the spirit and scope of the invention are intended to be included.

I claim:

1. Apparatus for depositing elongated, flexible material in a container and in a rosetta-shaped pattern therein, the material having a particular pay-in speed, the apparatus including a drum having an axis and a coiling head revolving about the axis for sequentially winding loops of the material onto the drum, additionally there being means for pushing the loops axially down for the respective lowest loop to drop into the container, the improvement comprising:

a pair of pulleys disposed for gripping the material of the dropping loop;

first means including a carrier for the pair of pulleys for revolving the pair of pulleys about the drum on the axis thereof;

second means for driving at least one of the pulleys at a peripheral speed faster than the pay-in speed of the elongated material;

third means for providing and defining an closed-loop guiding track for the carrier, the carrier having means engaging the track for guiding the disposition of the pair of pulleys in accordance with the track, the track having eccentric disposition in relation to said axis; and

means for driving the third means to rotate about the axis, so that the eccentricity of the track revolves about the axis, but at a relatively slow speed.

2. Apparatus as in claim **1**, the third means including a disc that includes said track and revolves about the axis of the drum, the second means including friction means driven by the disc for driving one of the pulleys of the pair.

3. Apparatus as in claim **1**, the carrier of the first means coupled to the coiling head to revolve in unison therewith.

4. Apparatus as in claim **3**, the first means including a pivotal link between the carrier and the coiling head to compensate the eccenticity of the path of the pair of pulleys by operation of the third means.

5. Apparatus as in claim **1**, the third means being a disc, eccentricity positioned to the axis of rotation of the revolving coiling head, the disc having an annular groove, the carrier for the pair of pulleys including a carriage that runs in said groove.

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