June 8, 1965 W. B. RAYBUCK 3,188,084

FOLDERS AND FEEDING APPARATUS

Filed April 22, 1963 3 Sheets-Sheet 1

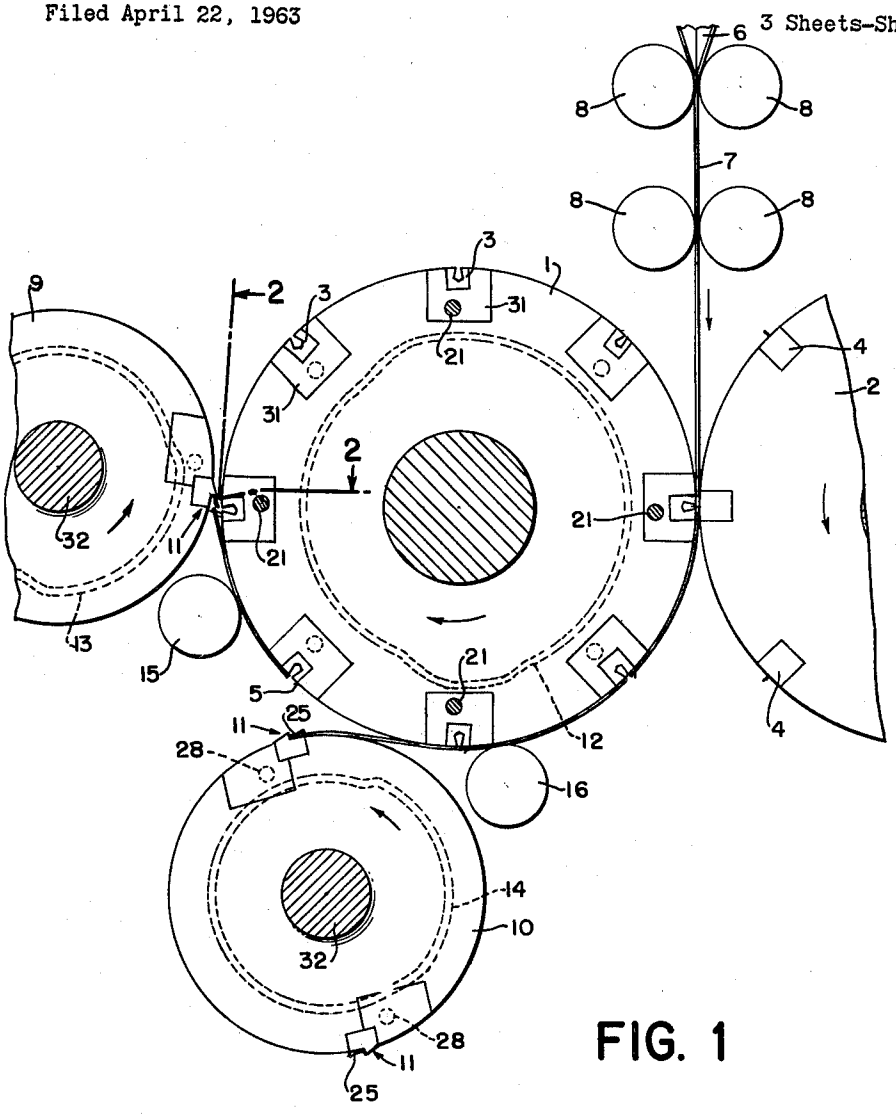

FIG. 1

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Filed April 22, 1963 3 Sheets-Sheet 2

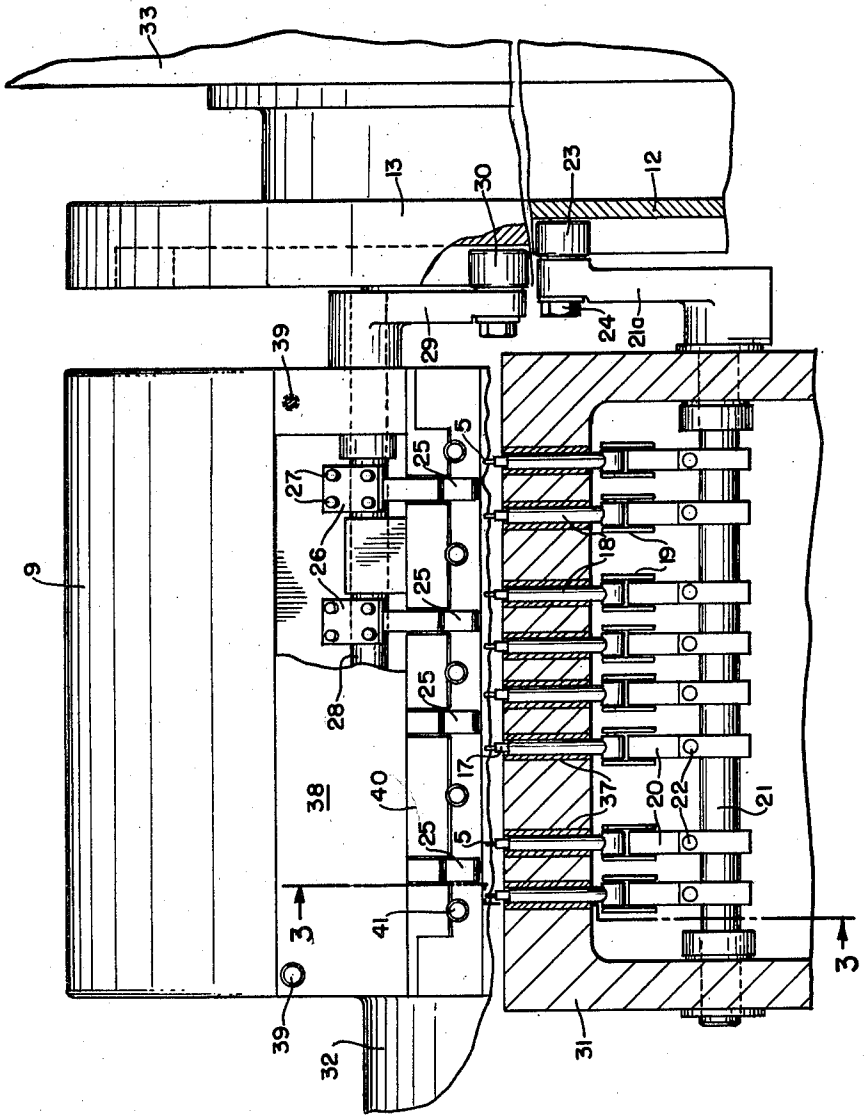

FIG. 2

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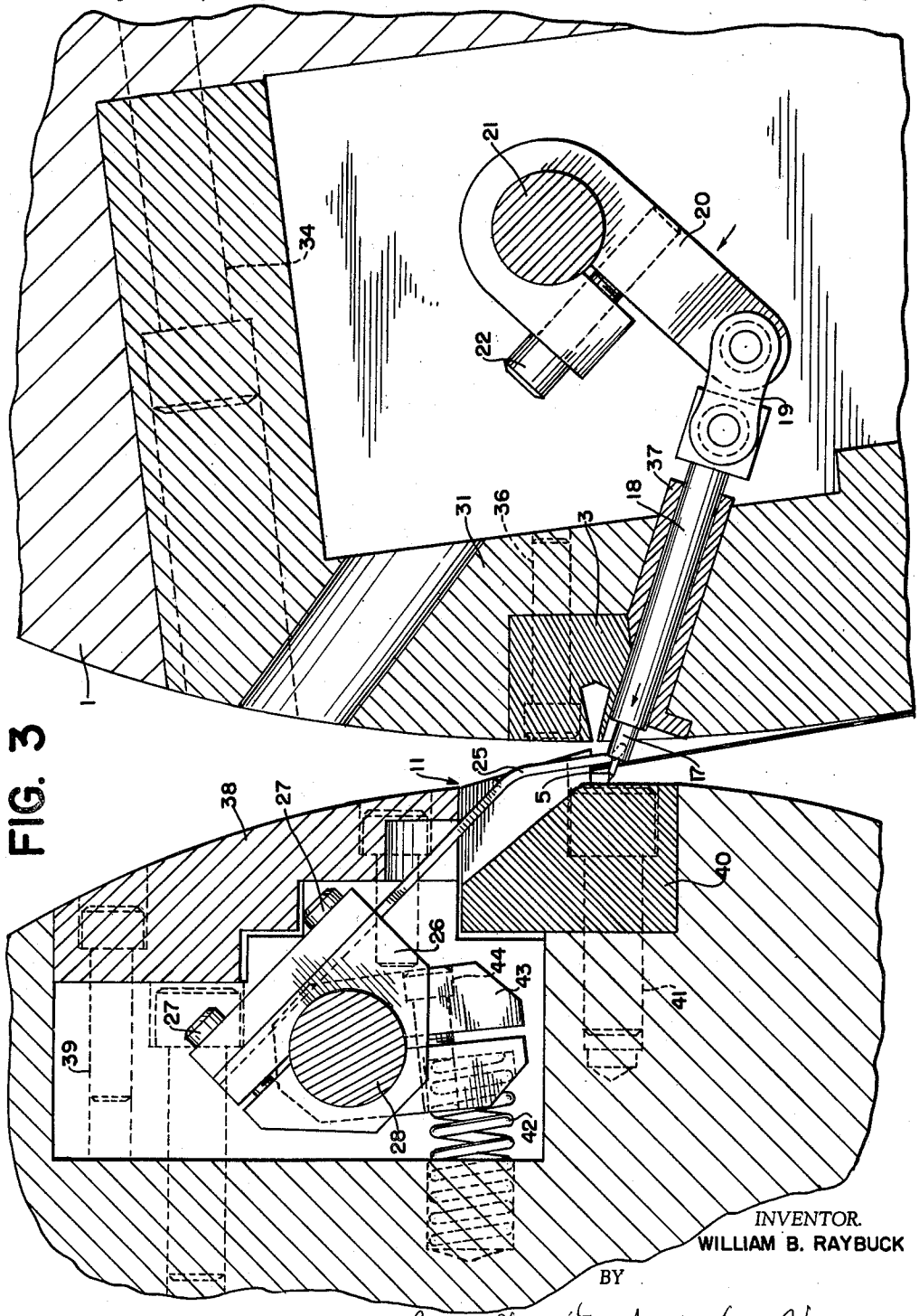
FIG. 3



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3,188,084

FOLDERS AND FEEDING OPERATORS

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3 Claims. (Cl. 271—82)

This invention relates generally to the art of printing and more particularly to that aspect thereof pertaining to the folding and cutting of the printed web passing from a rotary web-fed printing press.

In modern web-fed printing presses, the printed web passes from the press at high speed and must be cut, assembled and folded to form signatures for further assembly, folding and binding. Various types of cutting and folding mechanisms have been proposed for that purpose and are herein referred to generally as folders, as is customary in the art.

Most, if not all, of the proposed apparatus for this purpose comprises a cutting cylinder or a pair of cutting cylinders whereby a continuous folded web, or web which has been cut into ribbons and assembled in some manner, is cut transversely into predetermined lengths, herein referred to as "signatures," and the lead ends of the respective signatures impaled on pins, projecting outwardly from the cylinder, and carried thereby around the cylinder, as the cylinder rotates, to what is known in the art as a delivery or "gripper cylinder." The cylinder provided with impaling pins, whether or not equipped with cutting means, shall hereinafter be referred to as a pin cylinder.

The gripper cylinder is provided with one or more sets of gripper fingers adapted to grasp the impaled lead end of the signature, clamping it against a gripper pad on the periphery of the gripper cylinder, removing it from the pins on which it was impaled and carrying it around the gripper cylinders as the latter rotates, from which it is transferred to further assembly, folding or cutting apparatus, all as well understood in this art.

The invention relates more particularly to improvements in the method and means for effecting the transfer of the signature from the pin cylinder to the gripper cylinder and is applicable generally to apparatus of the general type described comprising a pin cylinder and a cooperating gripper cylinder, the actuation of the pins and grippers of the respective cylinders being coordinated in conventional manner. Apparatus of this type may comprise a single gripper cylinder cooperating with the pin cylinder, but usually will comprise at least two gripper cylinders, particularly since it is usually desirable to operate a gripper cylinder at a peripheral speed less than that of the peripheral speed of the pin cylinder, as well understood in this art.

Difficulty has heretofore been experienced in causing the gripper fingers to grasp the signature as the impaled signature approaches the gripper, usually at high speed. To accomplish this, it is necessary for the gripper fingers to pass between the signature and the body of the pin cylinder.

In an effort to avoid the difficulty experienced in causing the gripper fingers to grasp the signature, it has heretofore been proposed to grind away a portion of the normal periphery of the pin cylinder to provide an indentation in the normal periphery of the cylinder so as to permit the gripper finger to slide between the impaled signature and the periphery of the pin cylinder. This, however, has involved difficulties and also involves considerable expense.

I have found that the problem is more economically and more effectively solved, as hereinafter more fully described, by providing means for raising the impaled lead edge of the signature from the peripheral surface of the pin cylinder as it approaches the gripper finger.

In conventional practice, the impaling pins are cam-operated so that the impaling portion of the pin is projected beyond the periphery of the cylinder at the time of cutting, when impaling is required. Following impalement, the pin is retracted as the signature carried thereby passes between the pin cylinder and the gripper cylinder. These pins are conventionally gradually tapered at their outer ends and only the tapered portion of the pin is ever projected beyond the periphery of the pin cylinder.

In accordance with the present invention, I so designed and constructed the impaling pins as to provide an abrupt shoulder extending generally perpendicular to the pin axis to the rear of the impaling, tapered portion of the pin and I provide an actuating cam or cams so coordinated with the rotation of the cylinder, the peripheral positioning of the pin and peripheral position with respect to the gripping finger of the cooperating gripper cylinder, that the shoulder of the pin is projected beyond the periphery of the pin cylinder as the lead end of the signature approaches the gripper finger so that the impaled forward edge is raised by the pin shoulder from the periphery of the pin cylinder thereby permitting the gripper finger to pass beneath the signature, i.e., between the signature and the normal periphery of the pin cylinder.

Thus, in accordance with the present invention, it is no longer necessary to cut away a portion of the normal peripheral surface of the pin cylinder in the vicinity of the pins to accommodate the gripper fingers and the cylinder construction is thereby simplified with marked economic advantage.

The invention will be further described and one application thereof illustrated with reference to the accompanying drawings of which:

FIG. 1 is the fragmentary diagrammatic representation of a portion of a folder showing a cutter-pin cylinder and cooperating cutter-block cylinder and two cooperating gripper-transfer cylinders,

FIG. 2 is a somewhat fragmentary view partly in section along the line 2—2 of FIG. 1, and

FIG. 3 is an enlarged, detailed sectional view along the line 3—3 of FIG. 2.

As previously noted, the invention is applicable to any apparatus of the type described comprising a pin cylinder and one or more cooperating gripper cylinders, but for simplicity of description and illustration I shall describe the invention herein in its most elementary application comprising a conventional cutter-pin cylinder 1 and a cooperating cutter-block cylinder 2. Cylinder 1 is equipped with any desired number of cutter-blocks, represented at 3, which cooperate with the cutters 4 of cylinder 2, as well understood in the art. Adjacent each of the cutter-blocks on cylinder 1 there is an impaling pin indicated at 5 adapted to impale the lead end of the respective signatures resulting from the cutting of the incoming folded web or ribbon.

In operation, the printed web passing from the press will usually be cut longitudinally into ribbons and the ribbons assembled and folded before being passed to the transverse cutters from which the signatures result. In such operation, the assembled ribbons may be passed over a former, fragmentarily indicated at 6, whereby the assembled ribbons are folded forming a continuous assembly of folded ribbon 7 which passes between one or more pairs of cooperating pressure rolls 8 and thence through the bite between the previously described cooperating cylinders 1 and 2.

For simplicity of illustration, as previously noted, we have shown in FIG. 1 the retention of all of the signatures

on cylinder 1. However, in accordance with preferred practice, both cylinder 1 and cylinder 2 will be provided with cam-operated impaling pins so that alternate signatures are impaled by the pins of different cylinders, each of which cylinders is provided with one or more transfer cylinders of the gripper type presently to be described.

In the arrangement shown, two gripper cylinders 9 and 10 are provided for transferring the signatures from cylinder 1.

Such arrangement is desirable as it permits the gripper cylinders to be rotated at a further reduced peripheral speed.

As understood by the art, the peripheral speed of the gripper cylinders will be less than that of the pin cylinder so that the impaled lead ends of the signatures will be carried into the jaws of the grippers, indicated at 11, as they approach the respective gripper cylinder. Also, as well understood by the art, the number of sets of grippers for each gripper cylinder will depend upon the number of gripper cylinders employed and whether all of the signatures or only alternate signatures are impaled by the cooperating cutter-pin cylinder.

As is customary in the art, and as shown on FIG. 2 of the drawings, the lead ends of the signatures are impaled by a plurality of longitudinally-spaced pins and similarly a plurality of longitudinally-spaced gripper fingers will be provided. Advantageously, two impaling pins may be provided for each gripper finger and spaced on opposite sides of the gripper fingers. The pin cylinders and the gripper cylinders may be either plain or sectional, and actuation and coordination of the action of the sets of impaling pins and the sets of gripper fingers may be effected by automatically operating cam mechanisms controlled by stationary cams positioned at one or both ends of the respective cylinders.

What has heretofore been described with reference to the drawings is well-known to the art, constitutes no part of the present invention and therefore need not be described in further detail.

As indicated on FIG. 1 of the drawings, a cam 12 is positioned at one end, or at each end, of cylinder 1 for effecting projections and retraction of the impaling pins, and cams 13 and 14 are positioned at one end of the respective delivery cylinders 9 and 10 for actuating the gripper fingers. Also, in cooperation with cylinder 1, there are provided two power-driven timing rollers 15 and 16, just preceding the delivery cylinders 9 and 10, respectively, for directing the signatures into the jaws of the grippers 11 of cylinders 9 and 10, respectively.

In referring more particularly in FIGS. 2 and 3 of the drawing, the impaling pins 5 of cylinder 1 are, in accordance with the present invention, provided with abrupt shoulders 17 which determine the extent of penetration of the pins through the signatures and serve to lift signatures, as heretofore described. The shanks 18 of the pins extend inwardly of the cylinder and their inner ends are connected through flexible connections 19 to the respective arms 20 which in turn are rigidly connected to the cam shaft 21 as by means of collars and tension bolts 22 as more clearly shown in FIG. 3 of the drawing. The shaft 21 is in turn rigidly connected to the cam arm 21*a* (FIG. 2), the extreme end of which is provided with a cam follower 23 secured to the cam arm by suitable means, for instance by bolt and nut indicated at 24. The cam follower is actuated by means of cam 12 positioned at one end of the cylinder 1 or if desired a separate cam may be positioned at opposite ends of cylinder 1.

As previously noted, the impaling pins and the cam mechanism associated therewith are so constructed and arranged that on approaching the grippers of cylinder 9 or 10 the pins with the lead end of the signature impaled thereon are moved outwardly so that the shoulders 17 thereof project a substantial distance beyond the periphery of the cylinders thus raising the lead end of the signature so as to permit the gripper finger to slide between the signature and the periphery of the pin cylinder 1.

The gripper comprises an arm or finger 25 secured to a block 26, as by means of machine screws 27, positioned within the gripper cylinder, the block being secured to a cam shaft 28, said shaft being actuated by means of cam arm 29 secured to one end of the shaft and provided at its outer end with a cam follower 30 which cooperates with the cam member 13 positioned at one end of the gripper cylinder.

As more clearly shown on FIG. 3 of the drawings, the gripper fingers are so constructed and arranged that the outer portion thereof extends along the periphery of the gripper cylinder in the direction opposite the direction of rotation of that cylinder. Advantageously, the outer ends of the respective gripper fingers are curved outwardly from the periphery of the gripper cylinder to facilitate the sliding of the signatures beneath the gripper fingers.

The cylinders 9 and 10 are mounted on shafts indicated at 32 which are rotatably supported by the side frames 33 of the folder and are driven by conventional means. The cylinder 1 is similarly mounted and driven. However, the cam members 12, 13 and 14 are supported by conventional means in a fixed position.

The pins and operating mechanism therefor may be contained in the blocks 31, more clearly shown in FIG. 3 of the drawings, inserted in the body of cylinder 1 and secured thereto by means of machine bolts 34. The cutter-block 3 may be secured to the block as by means of machine bolts 36 and sleeves 37 may be provided for supporting the shanks of the impaling pins.

Similarly, the mechanism for supporting and actuating the gripper fingers may be contained within blocks 38 inserted in the gripper cylinder and secured thereto by means of machine bolts 39, the gripper pads 40 being secured to the block as by means of machine bolts 41. For cushioning the clamping action of the gripper arms, so as to avoid damaging the signature, it is desirable to provide means, such as a coil spring indicated at 42 which cooperates with member 43 secured to the cam shaft 28 as by means of machine bolts 44, to control the tension of the gripping arm against the gripper pad.

As will be apparent from the foregoing description, the cooperating cam mechanisms will be so constructed and arranged that, as the impaled lead end of the signature approaches the gripper cylinder 9, or the gripper cylinder 10, as the case may be, the pins impaling that signature will be extended outwardly from the periphery of cylinder 1 so that the shoulders 17 of the pins lift the lead end of the signature away from the periphery of the pin cylinder. Coincident therewith, the cam mechaism of the gripper assembly moves the gripper finger 25 outwardly from the periphery of the gripper cylinder so that the gripper finger will slide between the signature and the periphery of the pin cylinder, it being understood that the lead end of the signature is moving at a higher rate of speed than the peripheral speed of the gripper cylinder and that movement of the lead of the signature into the jaws of the gripper is further promoted by the timing rollers 15 or 16, in accord with conventional practice. By further coordinated action of the cam mechanism of the gripper cylinders, the gripper fingers are closed on the lead end of the signature clamping it between the gripper fingers and the gripper pads, thus releasing the signature from the pin impalement and carrying it about the gripper cylinder for delivery to other known elements of folder mechanisms.

I claim:

1. In apparatus for cutting and transmitting printed signatures from a rotary web-fed printing press comprising at least one rotatably-mounted pin cylinder equipped with impaling pins and means for automatically projecting the pins for impaling the lead ends of the signatures and for retracting the pins as the cylinder

rotates and at least one cooperating rotatably-mounted gripper cylinder equipped with at least one set of automatically operated gripper fingers for gripping the lead ends of the signatures when they are released from the pin, the improvement in means for transferring the signature from the pin cylinder to the gripper cylinder comprising so constructing the pins of the pin cylinder so as to provide an impaling portion of the pin and an abrupt shoulder thereon extending generally perpendicular to the axis of the pin, and positioned to the rear of the impaling portion of the pin, and cam means so constructed and arranged as to move the pin outwardly beyond the periphery of the pin cylinder a distance such that the shoulder thereof raises the signature from the cylinder surface as the pin approaches a gripper finger to permit the gripper finger to pass between the signature and the periphery of the pin cylinder.

2. The apparatus of claim 1 in which the gripper fingers are so constructed and arranged that the outer portion thereof extends along the periphery of the gripper cylinder in the direction opposite the direction of rotation of said cylinder, the outer ends of the respective gripper being curved outwardly from the periphery of the gripper cylinder to facilitate the sliding of the signature beneath the gripper finger.

3. The apparatus of claim 1 in which the gripper cylinder is provided with a plurality of gripper fingers spaced longitudinally along its periphery and the pin cylinder is provided with a plurality of the pins spaced longitudinally along its periphery to cooperate with the gripper fingers, one pin being positioned adjacent each side of each gripper finger.

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