W. H. DE BUSK.

ROTARY FOLDER FOR PRINTING PRESSES.

APPLICATION FILED JAN. 20, 1909.

942,136.

Patented Dec. 7, 1909.

Fig. 1.

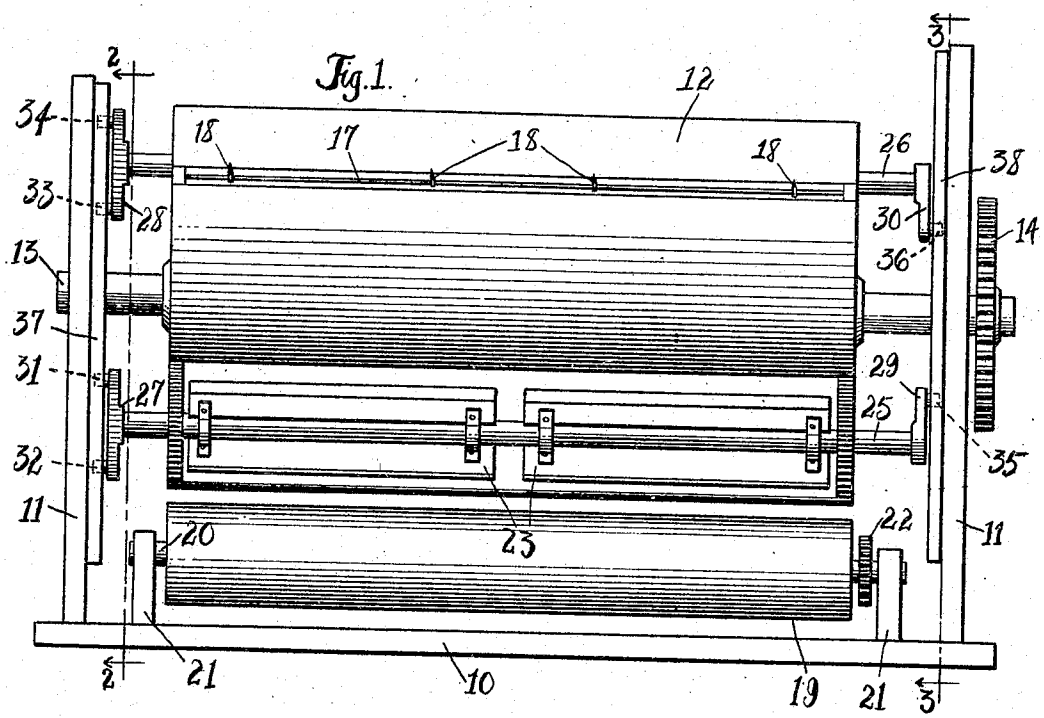


Fig. 2.

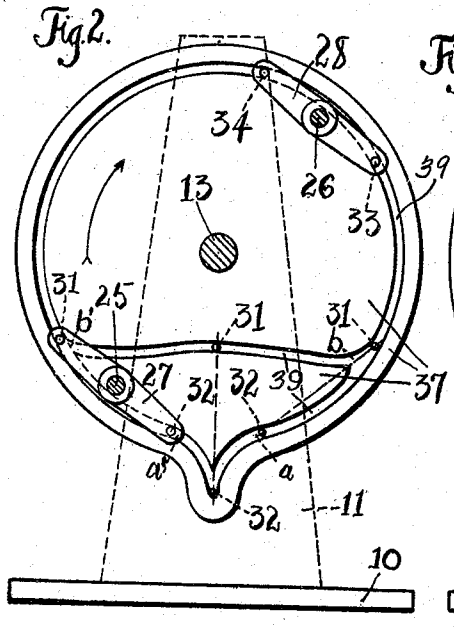
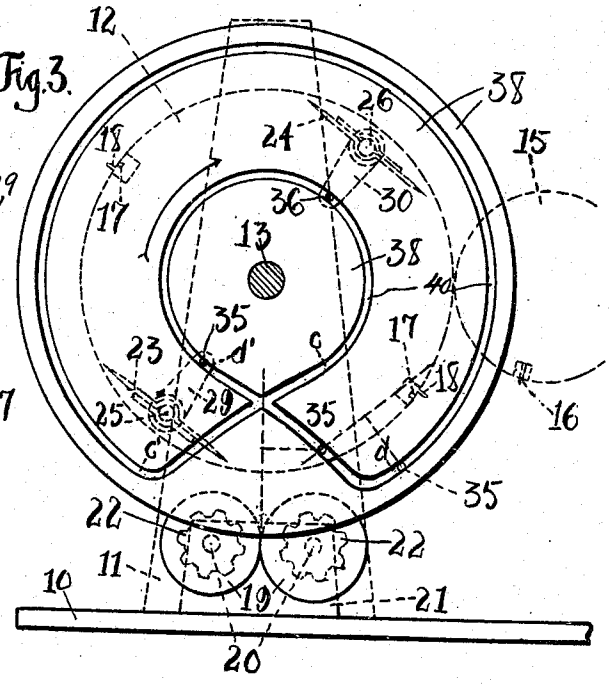


Fig. 3.



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ROTARY FOLDER FOR PRINTING-PRESSES.

942,136. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed January 20, 1909. Serial No. 473,236.

To all whom it may concern:

Be it known that I, WILLIAM H. DE BUSK, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Rotary Folders for Printing-Presses, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to rotary folders for printing presses and particularly to that class of folding machines in which a folding blade is mounted on the rotary carrier for the purpose of forcing the paper into the bite of two folding rolls, said blade being actuated by a stationary cam which engages a crosshead mounted on the blade shaft in the plane of the blade. There has never been any special difficulty in getting the blade to force the paper into the bite of the folding rolls, but considerable difficulty has been encountered in causing the blade to properly complete its turn in order to be in position for another operation to fold the next succeeding sheet. This difficulty is due to the fact that at the instant that the blade is directly in the bite of the folding rolls and that the blade and crosshead are perpendicular to the circle of rotation of the blade with the rotary carrier, the cross head and fixed cam are at the critical point of their coaction. It has been customary in some constructions to employ an oscillating or "flying" cam which assists in directing the blade into the bite of the folding rolls, and which, in the instant during which the blade stands perpendicular, is shifted slightly to close the cam groove behind the stud or roller on the crosshead, causing the blade to be positively turned.

It is the object of my invention to provide a construction which shall positively turn the folding blade without the use of any oscillating cam, and which shall insure the blade's being actuated at every phase of its turning by a portion of the actuating cams of comparatively easy slope relative to the general direction of movement of the blade with the rotary carrier, providing a stationary cam groove entirely free of movable parts, thus avoiding any danger of accidental contact between the crosshead and any such movable part, and materially increasing the speed at which the rotary carrier may be rotated without such violent contact of parts as will cause excessive wear or breakage. I accomplish this object in general by providing a plurality of arms revoluble with the folding blade and devices acting upon such arms to turn the folding blade, said arms being at a sufficient angle to each other that, at the time that one arm and its actuating device are at the critical point of their coaction in turning the folding blade as the rotary carrier rotates, another arm is being actuated positively to turn said folding blade by another actuating device so positioned relative to the direction of movement of the folding blade shaft and said second arm upon which such second actuating device operates that at that time said second arm and actuating device may be at a relatively very effective point of their coaction. In the construction shown, when one arm and its cam are at the critical point of their coaction in turning the folding blade as the rotary carrier rotates, the other arm is being actuated positively to turn said folding blade by a portion of its cam which is relatively very effective by reason of being at an advantageous angle relative to the position and the direction of movement of the blade shaft and the position of the arm which bears upon the cam.

In the drawings:—Figure 1 is a side view of my improved folding machine; Fig. 2 is a section taken at line 2—2 of Fig. 1; and Fig. 3 is a section taken at line 3—3 of Fig. 1, indicating in dotted lines the support at that end of the machine, and also an ordinary web-cutting cylinder, and indicating diagrammatically successive positions of the folding blade.

Referring to the drawings:—10 indicates a base and 11 indicates supporting standards.

12 indicates the rotary carrier mounted upon the shaft 13 journaled in the standards 11 and provided with a gear 14 adapted to be driven from any suitable source of power. 15 indicates the ordinary cutting cylinder provided with a knife 16 adapted to coact with the cutting groove 17 to sever the web of paper led around by the rotary carrier in the ordinary manner, being engaged for this purpose by the impaling pins 18.

19 indicates folding rolls mounted on shafts 20 which are journaled in standards 21 and are provided with gears 22 adapted to be driven from any suitable source of power.

The parts so far described are of ordinary

construction and it is not believed it is necessary to describe them further here.

23—24 indicate folding blades non-rotatably mounted on shafts 25—26, respectively, which are journaled near the periphery of the rotary carrier 12, the cylinder surface being cut away to permit of the rotation of such folding blades, as will be readily understood. As shown in Fig. 1, these folding blades, in the construction shown, are made in two sections, but they may be otherwise formed.

27—28 indicate crossheads non-rotatably mounted on the extended ends of the shafts 25—26, respectively, at one end of the rotary carrier, and 29—30, respectively, indicate arms non-rotatably mounted on the opposite ends of said shafts. As shown in Fig. 1, each of the crossheads 27—28 is, in the construction shown, in the plane of its respective folding blade, while each of the arms 29—30 is, in the construction shown, at right angles to the plane of its respective blade.

31—32 indicate studs, preferably in the form of rollers, carried by the crosshead 27, and 33—34 indicate such studs carried by the crosshead 28.

35 indicates a stud, preferably in the form of a roller, carried by the arm 29, and 36 a stud or roller carried by the arm 30.

37 indicates the actuating cam member which coacts with the crossheads 27—28, and 38 indicates the actuating cam member which coacts with the arms 29—30, said cam members, in the construction shown, being secured in any suitable manner to the adjacent supporting standards 11.

39 indicates a cam groove formed in the cam member 37, and 40 a cam groove formed in the cam member 38.

As will be seen by reference to Fig. 2, the greater part of the cam groove 39 is circular in form concentric with the shaft 13. The lower portion of the groove 39, however,—say from a to a',—is of any desired shape to insure the desired motion of the folding blade with reference to the folding rolls, as has been customary in folding machines of this general type, and as will be readily understood. The shunt portion of the cam groove 39,—say from b to b',—is marked out by the path of one of the rollers 31—32 when the other of said rollers is moved along the predetermined groove a—a'. In like manner, the greater portion of the cam grooves 40—40 are circular in form, the lower portions of said grooves,—say from c to c' and from d to d',—being marked out by the path of the roller 35, the cam portion d to d' being marked out by the roller 35 when the roller 32 approaches the lower portion of the groove 39 in advance, and the cam portion c to c' being marked out by the roller 35 when the roller 31 approaches the lower portion of the groove 39 in advance, as will be understood more fully from a description of the operation of the machine. I have described the cam portions as being marked out by the rollers connected with the folding blade 23 merely for convenience of description, the blades 23 and 24 and their operating parts being duplicates of each other.

The operation of the parts is as follows:—With the rotary carrier revolving in the direction indicated by the arrows in Figs. 2 and 3, and with the folding blade 23 approaching the folding rolls 19 with the stud or roller 32 in advance, as indicated in dotted lines diagrammatically at the lower right-hand side of Fig. 2, the arm 29 will be turned outward away from the rotary carrier proper and the roller 35 will be approaching the portion d—d' of the groove 40. When the roller 32 strikes the beginning of the groove portion a—a', the shaft 25 will be rotated slightly contra-clockwise, as seen in Figs. 2 and 3, the roller 31 being thus turned into the groove portion b—b', and the roller 35 will enter the groove portion d—d'. Inasmuch as the beginning of the groove portion a—a' is of a very gentle slope relative to the direction of revolution, this first turning will be accomplished without a severe blow or contact of parts, and while the slope of the effective part of the cam groove portion a—a' thereafter becomes more and more severe, the slope of the effective part of the groove portion b—b' which the roller 31 is traversing remains quite easy until the roller 35 has gotten well along in the groove portion d—d', the effective part of which groove portion d—d' becomes of a more and more gentle slope relative to the direction of revolution of the blade-shaft as the effective part of the groove portion b—b' becomes less and less efficient on account of being more and more nearly parallel with the direction of movement of the blade shaft. As shown by the vertical dotted position of the folding blade in Figs. 2 and 3, at the time that the cam member 39 and crosshead 27 are at the critical point of their coaction, the roller 35 is moving in an easy portion of the groove d—d', absolutely insuring positive turning of the folding blade and preventing any severe contact of parts at that point. As the folding blade passes the vertical position, the roller 31 again approaches an easy stage of the groove b—b', delivering the crosshead again to the circular portion of the groove 39 without any violent blow, the bearing of the roller 31 in the groove b—b' preventing any blow as the roller 35 passes the intersection of the grooves c—c' and d—d', and the bearing of the roller 32 in the latter part of the groove portion a—a' preventing a blow as the roller 31 leaves the groove b—b'. As the folding blade 24 next approaches folding

position with the roller 33 in advance, said roller will of course in the first place turn the roller 34 into the groove *b*—*b'*, and the roller 36 will coöperate with the roller 33 in the same manner that the roller 35 coöperated with the roller 32, except that the roller 36 will of course be moving through the cam portion *c*—*c'* instead of through the portion *d*—*d'*. The bearing of the roller 34 in the groove *b*—*b'* will prevent a blow as the roller 36 passes the intersection of the grooves *c*—*c'* and *d*—*d'*, while the bearing of the roller 33 in the latter part of the groove *a*—*a'* will prevent a blow as the roller 34 leaves the groove *b*—*b'*. It will be understood that for the next succeeding folding operation, the roller 35 on the arm 29, which will then project inward instead of outward as at first, will bear in the groove *c*—*c'*, the roller 31 on the crosshead 27 approaching folding position in advance instead of the roller 32 as before. Likewise for the fold next succeeding, the roller 36 on the arm 30, which will then project outward instead of inward as at first, will bear in the groove *d*—*d'*, the roller 34 on the cross head 28 approaching the folding rolls 19 in advance instead of the roller 35 as before. It is thus seen that the folding blade is given the desired turn positively, without the aid of any oscillating part, and that any severe blow or contact of parts at any phase of the operation is prevented.

I have not described the operation of the machine in connection with a web of paper or with reference to the action of the cutting cylinder or folding rolls, as these matters are well understood and form no part of my present invention.

While I have shown and described the rotary carrier as being provided with two folding blades, it will be understood that any other suitable number of folding blades may be used.

While I have shown and described the crosshead as being in the plane of the folding blade and the crosshead and the arm on each folding blade shaft as being at right angles to each other, and prefer to employ such construction, I do not restrict myself to that particular construction, as the device would be operative at other angles. Neither do I restrict myself to the use of three studs on each folding blade, as the device will operate with either a smaller number of studs or with a greater number, said studs being properly positioned in different planes passing through the axis of rotation of the folding blade relative to said rotary carrier.

While I have shown the members carried by the crossheads and arms which bear upon the cams in the form of studs or rollers, it will be understood that I do not restrict myself to that particular construction but that any suitable bearing members may be used. The claims, therefore, which call for such bearing studs, are to be construed accordingly.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In a rotary folder, the combination with a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, a bearing stud revoluble with said folding blade relative to said carrier, and means adapted to engage said bearing stud as said carrier rotates and thereby to turn said folding blade, of a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the folding blade axis at an angle to the plane which passes through said first-mentioned bearing stud and said folding blade axis, and means adapted to engage said second bearing stud as said carrier rotates and thereby to turn said folding blade, each turning means and its coöperating bearing stud being adapted to turn said folding blade into and past the position at which the plane passing through the other of said bearing studs and through said folding blade axis is perpendicular to the circle of rotation of said rotary carrier.

2. In a rotary folder, the combination with a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, a bearing stud revoluble with said folding blade relative to said carrier located in the plane passing through the edge and the axis of the folding blade, and means adapted to engage said bearing stud as said carrier rotates and thereby to turn said folding blade, of a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the axis of said folding blade at an angle to said first-mentioned plane, and means adapted to engage said second bearing stud and adapted by itself to positively turn said folding blade into and past its position perpendicular to the circle of rotation of said carrier.

3. In a rotary folder, the combination with a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relative thereto, a bearing stud revoluble with said folding blade relative to said carrier, and means adapted to engage said bearing stud as said carrier rotates and thereby to turn said folding blade, of a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the axis of said folding blade at an angle to the plane which passes through said first-mentioned bearing stud and through said folding blade axis and also at an angle to the plane which passes through the edge and the

axis of the folding blade, and means adapted to engage said second bearing stud as said carrier rotates and thereby to turn said folding blade into and past the position at which said plane passing through said first-mentioned stud and said folding blade axis is perpendicular to the circle of rotation of said rotary carrier.

4. In a rotary folder, the combination with a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, a bearing stud revoluble with said folding blade relative to said carrier, and a cam adapted to engage said bearing stud as said carrier rotates and thereby to turn said folding blade, of a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the folding blade axis at an angle to the plane which passes through said first-mentioned bearing stud and said folding blade axis, and a cam adapted to engage said second bearing stud as said carrier rotates and thereby to turn said folding blade, that portion of each cam which is being traversed by one of said bearing studs immediately before and after the time when the plane which passes through the other of said bearing studs and through the folding blade axis is perpendicular to the circle of rotation of the carrier being relatively very effective to turn said folding blade without a blow or violent contact of parts by reason of being at an advantageous angle relative to the direction of movement of the blade shaft taken in connection with the relative positions of the blade shaft and the bearing stud upon which said cam is acting.

5. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a bearing stud revoluble with said folding blade and positioned outside the plane passing through the edge and the axis of the folding blade and in a plane intersecting said first-mentioned plane at right angles along a line intermediate the edges of the blade, and a stationary cam adapted to act upon said bearing stud and adapted by itself to positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

6. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a bearing stud revoluble with said folding blade and positioned outside the plane passing through the edge and the axis of the folding blade and in a plane intersecting said first-mentioned plane at right angles along a line near the axis of rotation of said blade on said rotary carrier, and a stationary cam adapted to act upon said bearing stud and adapted by itself to positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

7. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a stationary cam portion adapted upon each alternate revolution of the rotary carrier to act upon said folding blade and adapted by itself to positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier, and a second stationary cam portion adapted upon each other alternate revolution of said rotary carrier to act upon said folding blade and adapted by itself to positively turn said folding blade into and past a position perpendicular to the said circle of rotation of said folding blade with said rotary carrier.

8. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a single bearing part revoluble with said folding blade and positioned outside the plane passing through the edge and the axis of the folding blade and two cam portions adapted alternately upon successive revolutions of the rotary carrier to act upon said bearing part and positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

9. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a single bearing part revoluble with said folding blade and positioned outside the plane passing through the edge and the axis of the folding blade and two stationary cam portions adapted alternately upon successive revolutions of the rotary carrier to act upon said bearing part and positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

10. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, and means adapted to turn said folding blade, said means comprising a single bearing part revoluble with said

folding blade and positioned outside the plane passing through the edge and the axis of the folding blade and two rigid stationary cam portions adapted alternately upon successive revolutions of the rotary carrier to act upon said bearing part and positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

11. In a rotary folder, the combination of a rotary carrier, a revoluble folding blade carried thereby and means adapted to turn said folding blade, said means comprising a bearing stud revoluble with said folding blade and positioned in the plane which passes through the axis of said folding blade at right angles to the plane of the folding blade and a cam adapted to act upon said bearing stud and positively turn said folding blade into and past a position perpendicular to the circle of rotation of said folding blade with said rotary carrier.

12. In a rotary folder, the combination with a rotary carrier, a shaft journaled therein, a folding blade carried by said shaft, a crosshead mounted on said shaft in the plane passing through the edge and the axis of said folding blade, a stud on each end portion of said crosshead, and two cam portions each adapted to bear upon one of said studs, of other means adapted by itself to carry said folding blade past the critical point of the engagement of said cam portions with said studs, such means comprising an arm mounted on said shaft, a stud on said arm, and a cam portion adapted to engage said last-mentioned stud.

13. In a rotary folder, the combination of a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, a bearing stud revoluble with said folding blade relative to said carrier, a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the axis of said folding blade at an angle to the plane which passes through said first-mentioned bearing stud and said axis, and means adapted to bear upon said studs as said carrier rotates to turn said folding blade, said turning means being adapted to engage effectively each of said bearing studs in turn at the time that the plane passing through the other of said bearing studs and through the folding blade axis is perpendicular to the circle of rotation of said rotary carrier, the point of the said effective engagement of said turning means with said stud being to one side of said last-mentioned plane when the plane is in position perpendicular to the circle of rotation of said carrier.

14. In a rotary folder, the combination with a rotary carrier, a folding blade adapted to rotate therewith and mounted revolubly relatively thereto, a bearing stud revoluble with said folding blade relative to said carrier, and means adapted to engage said bearing stud as said carrier rotates and thereby to turn said folding blade, of a second bearing stud revoluble with said folding blade relative to said carrier and positioned in a plane which passes through the folding blade axis at an angle to the plane which passes through said first-mentioned bearing stud and said folding blade axis, and means adapted to engage said second bearing stud as said carrier rotates and thereby to turn said folding blade, each of said turning means and its coöperating bearing stud being adapted to turn said folding blade into and past the position at which the plane passing through the other of said bearing studs and through said folding blade axis is perpendicular to the circle of rotation of said rotary carrier, said turning means and studs being effective to rotate said folding blade relative to said rotary carrier during a portion only of each revolution of said carrier, said blade being given only a partial revolution relative to said carrier during each revolution of said carrier.

15. In a rotary folder, the combination with a rotary carrier, a folding blade shaft mounted to move in a path concentric with the rotation of said carrier, a folding blade non-rotatably secured on said shaft, an arm non-rotatably secured on said shaft, a stud mounted on said arm, and a cam adapted to engage said stud as said carrier rotates and thereby to turn said folding blade, of a second arm non-rotatably mounted on said shaft, a stud mounted on said second arm in a different plane passing through said folding blade axis from that which passes through the stud on said first-mentioned arm and through said folding blade axis, and a cam adapted to engage said second stud as said carrier rotates and thereby to turn said folding blade, each cam and its coöperating stud and arm being adapted to turn said folding blade into and past the position at which the plane passing through the other stud and through the folding blade axis is perpendicular to the circle of rotation of said rotary carrier.

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Witnesses:
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