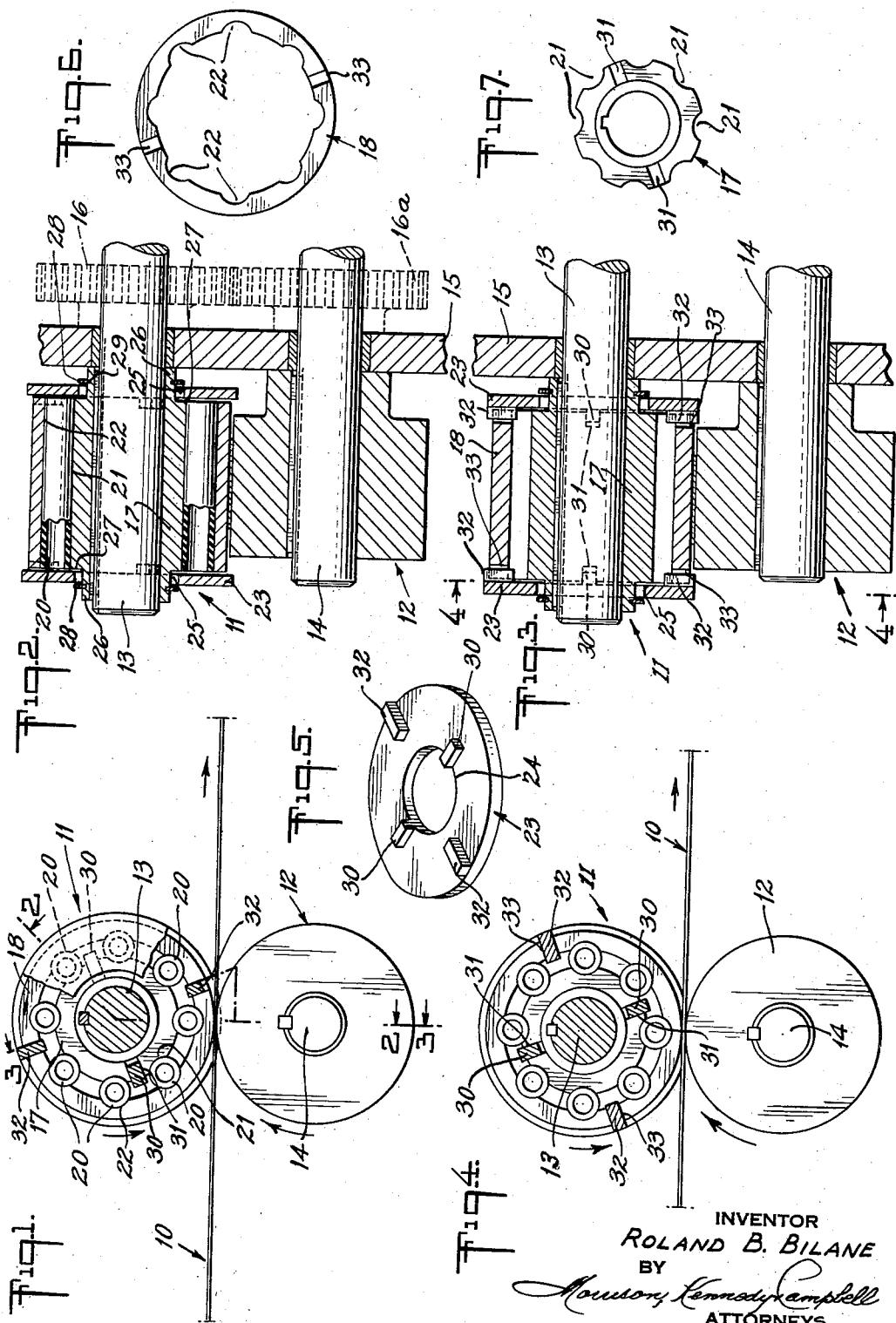


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R. B. BILANE
STRIP FEEDING DEVICE

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STRIP FEEDING DEVICE

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The present invention relates to strip feeding means and particularly to rotary devices for feeding flat web-like strips.

Continuous flat strips can be advanced by a feed device comprising a pair of opposed rotary feed rolls having peripheral tractive engagement with the strip therebetween. In order to maintain constant effective tractive engagement with the strip, one of the feed rolls may have a rim member of rigid material, such as metal resiliently mounted on or coupled to a hub member or supporting shaft by elastic means, arranged around the center of said rim member and permitting the rim member to yield radially with respect to the shaft or to the hub member as the rim member is rotated in feed engagement with the strip. The rim member, thereby, elastically presses against the strip and maintains constant feed engagement therewith. However, in this construction, the rim member, through the instrumentality of the elastic supporting means, is not only free to yield radially to a limited extent with respect to the hub member or supporting shaft, but is also free to turn circumferentially to a limited extent with respect to this hub member or shaft. When the strip is fed intermittently, for the purpose, for example, of performing some operations on predetermined sections thereof, the inertial forces set up in the feed rolls may cause erratic torsional displacements of the rim member with respect to the hub member or shaft and may thereby cause defective feeding of the strip. This may cause the strip to be improperly indexed with respect to the station adapted to operate thereon, so that the mechanical operations are not performed on the strip in the correct places.

One object of the present invention is to provide a strip feeding roll device which includes a feed roll with an elastically supported rim member radially yieldable with respect to the axis of the supporting shaft and which is constructed to positively prevent circumferential displacement of the rim member with respect to the shaft during operations, so that proper index feeding of the strip is assured, even under the most severe conditions of intermittent operation encountered.

In accordance with the present invention, the roll device is of the general character described, in that it includes a feed roll, a hub member in the form of a shaft or of a sleeve affixed to a shaft, an outer rigid rim member, and resilient means supporting the rim member for limited radial movement with respect to the axis of the hub member. However, as a feature of the present invention, one or more key devices are provided, positively locking the rim member to the hub member for rotation in unison, so as to prevent circumferential displacement of the rim member with respect to the hub member during strip feeding operations, but releasing the rim member for limited radial movement with respect to the hub member in every rotative position of the feed roll. The rim member is thereby free to move radially and elastically with respect to the hub member, so that it will engage the strip tractively with elastic pressure at all times,

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but is positively restrained against circumferential displacement with respect to the hub member, even under the torsional influence of severe inertial forces. Thus, the feeding of the strip at a predetermined speed is maintained and the proper indexing of the strip with respect to any operating station along the feed course of the strip is assured.

Various other objects, features and advantages of the invention are apparent from the particular description and from the accompanying drawings, in which—

Fig. 1 is a face view of a strip feeding roll device embodying the present invention and shown in one rotative position with end parts broken away to reveal the interior structure of the device;

Fig. 2 is a radial section of the strip feeding roll device taken along lines 2—2 of Fig. 1;

Fig. 3 is a radial section of the strip feeding device taken along the lines 3—3 of Fig. 1;

Fig. 4 is a face section of the strip feeding roll device taken along the lines 4—4 of Fig. 3 and showing this device in another rotative position;

Fig. 5 is a perspective of a key plate serving as one of the elements for locking the hub member and the resiliently supported rim member of a feed roll for rotation in unison;

Fig. 6 is a face view of the rim member of the feed roll; and

Fig. 7 is a face view of the hub member of the feed roll.

Referring to the drawings, there is shown a flat web-like continuous strip 10 adapted to be advanced longitudinally by the feeding device of the present invention. This strip 10 may be of any suitable form and construction and is illustrated of substantially uniform thickness, although it may be of varying thickness, in which case, the feeding device may be modified in the manner to be described.

The continuous strip 10 is adapted to be fed by a feed device comprising a pair of opposed feed rolls 11 and 12 having feed gripping engagement with the strip therebetween to advance it longitudinally towards some operating station, as for example, a cutting station. These rolls 11 and 12 are shown in superposed relationship and are mounted on respective shafts 13 and 14 supported on fixed centers in suitable bearings in the frame structure 15 of the machine. The shafts 13 and 14 may be driven in unison, as for example, by means of intermeshing gears 16 and 16^a on said shafts, respectively.

One of the rolls, as for example, the lower roll 12, is of rigid construction, with its rim section supported in fixed concentric relationship with respect to its supporting shaft 14, and is shown specifically made of one piece of suitable metal, such as steel. The other upper roll 11 comprises a hub member 17 desirably of metal such as steel, keyed or otherwise affixed to the shaft 13 and an outer rim member 18, also desirably of metal, such as steel, radially spaced from the hub member to permit limited radial movement of the rim member in the plane of the roll. This rim member 18 may be faced with thin rubber, fabric or other material to enhance its frictional hold on the strip to be advanced.

The hub member 17 and the rim member 18 are resiliently connected or coupled together by resilient means, which may take any suitable specific form and which may, for example, except for certain modifications to be described, take the specific form of any of the embodiments illustrated in the copending application Serial No. 214,418, filed March 7, 1951, now Patent No. 2,715,024, dated August 9, 1955. In the specific embodiment illustrated, these resilient means are in the form of a series of elastic elements 20 arranged between the hub member 17 and the rim member 18 and around the hub member

and serving conjointly to urge yieldably the outer rim member 18 into centered position with respect to the axis of the shaft 13. These elastic elements 20 are shown in the form of blocks of elastomeric material, such as rubber, and more specifically in the form of cylindrical rubber tubes arranged with their axes parallel to the shaft axis. The rubber tubes 20 are shown all of the same external and internal diameters and are set into correspondingly shaped pockets 21 and 22 located in the confronting peripheries of the roll members 17 and 18. The pockets 21 and 22 are arranged in pairs, with the pockets of each pair disposed in radial opposition, and the rubber tubes 20 are firmly secured in these pockets by any suitable means, as for example by cement. These rubber tubes 20, thereby, yieldingly resist any eccentric or radial movement of the rim member 18 with relation to the hub member 17, thus forcing this rim member against the strip 10 with yielding pressure.

Where the strip is of substantially uniform thickness, the resistance to radial movement of the rim member 18 under the influence of strip feeding action is substantially uniform around the hub member 17. Under these conditions, the elastic tubes 20 are of the same diameter, thickness and length and are equally spaced around the hub member 17, as shown. However, if the strip to be fed is of varying thicknesses with alternate thin and thick sections recurring regularly, and it is desired to feed this strip with substantially uniform tractional pressure, the tubes 20 may vary in strength, by providing long and short tubes and arranging these to conform with the pattern of variation of the thickness of the strip, as disclosed in the aforesaid Patent No. 2,715,024.

To lock the rim member 18 to the hub member 17 against torsional displacement with respect to the hub member, while permitting the rim member to move radially with respect to the hub member in all rotative positions of the feed roll 11, there is provided a key device comprising a pair of similar key or lock plates 23, each in the form of a flat disc ring having a center hole 24 large enough to fit with an annular clearance 25 over an axial end extension 26 of reduced diameter on the hub member 17. Each key plate 23 is retained on the corresponding end hub extension 26 and substantially against an axially facing shoulder 27 formed by this extension, by any suitable means, as for example, by a cotter pin, or by a split snap ring 28 fitted into a peripheral recess 29 in this end hub extension, as shown.

The key ring plates 23 on opposite ends of the roll 11 extend radially across the full diameter of the rim member 18 and may extend even beyond this rim member, since any such extensions will not interfere with feed operation of the lower roll 12 but will flank this lower roll with safe clearance, as shown. Each of these key plates 23 carries integrally on its inner face near its inner periphery, a pair of diametrically aligned keys 30 in rectangular block form, fitting with a snug radial slide fit into respective diametrically aligned recess guideways 31 in the corresponding end of the hub member 17, so that the key plates are positively locked to the hub member for rotation therewith. To lock positively the rim member 18 to the key plates 23 and thereby to the hub member 17, so that these members will rotate in unison, each key plate 23 carries on its inner face near its outer periphery, a pair of diametrically aligned keys 32 in rectangular block form, extending with a snug radial slide fit into respective diametrically aligned recess guideways 33 in the corresponding end of the rim member. These rim locking keys 32 are arranged along a diametrical line at right angles to the diametrical alignment line of the keys 30. This quadrant arrangement of the keys 32 and 30 will permit the rim member 18 to slide in a radial direction relative to the key plates 23, along the keys 32 on the key plates, and will permit the key plates themselves, due to the presence of the annular clearances 25 between the key plates and the hub end extensions 26, to slide radially along the guideways 31 in the hub member

17 in a direction at right angles to said radial direction of movement of the rim member 18.

In the operation of the feed device described, the rolls 11 and 12, rotating at the same peripheral speed, engage the strip 10 therebetween with sufficient tractive pressure to feed this strip at the same speed. The rim member 18 of the upper roll 11, being resiliently supported through the elastic elements 20, presses elastically against the strip 10 and maintains feeding pressure thereon at all times, in spite of any variations in the thickness of the strip. Any such variations will cause the rim member 18 to move radially, and alternately by and against the action of the elastic elements 20.

While the upper roll 11 is in rotative position in which the alignment line of action of the keys 30 extends generally horizontal or substantially parallel to the direction of feed of the strip, as shown in Fig. 1, the key plates 23 are locked to the hub member 17, not only against rotation relative to the hub member, but through the abutting or stop action of the walls of the guideways 31 upon said keys, against radial movement in a generally vertical direction with respect to the hub member. However, during this rotative phase of the feed device, the alignment line of action of the keys 32 extends generally vertical or at right angles to the general direction of feed of the strip, as shown in Fig. 1, so that the upward reaction pressure of the strip transmitted to the rim member 18 will permit the rim member to slide radially and generally vertically along the keys 32 on the plates 23, while the plates remain locked against generally vertical movement with respect to the hub member 17, thereby causing the rim member to accommodate itself radially to the thickness of the strip.

While the upper roll 11 is in rotative position in which the alignment line of action of the keys 32 extends generally horizontal or substantially parallel to the direction of feed of the strip, as shown in Fig. 4, the rim member 18 is locked to the key plates 23, not only against rotation relative to said key plates and in turn against rotation relative to the hub member 17, but due to the abutting or stop action of the walls of the guideways 33 upon the keys 32 on said key plates, is locked against radial upward movement relative to said key plates. However, during this rotative phase of the feed device, the alignment line of action of the keys 30 extends generally vertical, as shown in Fig. 4, so that the key plates 23 are free to move radially and generally vertically along the guideways 31 on the hub member 17. Since, during this rotative phase of the feed device, the rim member 18 is locked to the key plates 23 against relative vertical radial movement, and since the key plates are free to move generally vertically and radially relative to the hub member 17, as described, the rim member will also be free to move with said key plates vertically and radially relative to the hub member, thereby causing said rim member in this phase position to accommodate itself radially to the thickness of the strip.

During recurring rotative cycles of the feed device, the rim member 18 will be locked against rotation with respect to the hub member 17 through the holding action of the key plates 23, but will be permitted to move radially in a direction at right angles to the direction of feed of the strip through movements of the rim member relative to the key plates, or through movement of the rim member with the key plates, according to the rotative phases of the feed device, as described. In phases intermediate to those described, the rim member 18 may move radially in a direction at right angles to the direction of feed of the strip, both relative to the key plates 23 and partly with the key plates, so that the radial movement of the rim member may be the result of these two movements. In any case, the rim member 18 is free to move radially relative to the hub member 17 in a direction at right angles to the direction of feed of the strip and to accommodate itself, thereby, to the thickness of the strip, in all rotative positions of

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the feed roll 11. The elastic feed pressure of the feed roll 11 upon the strip is thereby maintained at all times.

Since the rim member 18 cannot be displaced circumferentially relative to the hub member 17 during feed operations, even when the feeding is intermittently stopped to permit some operation or operations to be performed on the strip and even when the feeding is resumed, proper indexing of the strip with respect to the station or stations where these operations are performed is maintained.

In the embodiment of the invention disclosed, the key device comprises two duplicate key plates 23 at opposite ends of the feed roll 11 with the corresponding keys on the two key plates in alignment parallel to the axis of this feed roll, and each key device comprises four keys 30 and 32 arranged in diametrical pairs at right angles to each other. This duplication in the key plates 23 and in the keys 30 and 32 is desirable for balance and stability. However, as far as some of the broader aspects of the invention are concerned, a single key plate 23 may be employed and this plate may be, as shown, with four keys 30 and 32 in diametrical pairs at right angles to each other or with a single key 30 and a single key 32 arranged circumferentially 90° apart.

Also, although a hub member 17 separate from the shaft 13 but keyed thereto has been specifically shown in the embodiment, it must be understood that the shaft may serve both as a shaft and as a hub for the rim member 18 and may be shaped with pockets corresponding to pockets 22 for receiving the rubber tubes 20. Therefore, in the following claims, unless otherwise indicated, by "hub member" is intended to cover a sleeve locked to a separate shaft for rotation therewith, as shown, and also a shaft serving both of these functions.

Furthermore, it should be noted that instead of providing keys 30 and 32 in the key plates 23 and recess guideways 31 and 33 therefor in the hub member 17 and rim member 18, as shown, as far as some of the broader aspects of the invention are concerned, the hub member and rim member may be provided with key extensions and the key plates may have the recess guideways for these extensions.

What is claimed is:

1. In a strip feeding device, a feeding roll having a hub member and a rim member of rigid material encircling the hub member of rigid material, elastic means coupling said members together in radially spaced relationship and permitting limited bodily radial movement of the rim member relative to the hub member, a lock member, means positively connecting the lock member to the hub member for rotation in unison in either direction while guiding the lock member for movement relative to the hub member in a pure radial direction only, and means positively connecting the lock member to the rim member for rotation in unison in either direction while guiding the rim member for movement relative to the lock member in a pure radial direction only at right angles to said radial direction of movement of the lock member.

2. In a strip feeding device, a feeding roll having a hub member and a rim member encircling the hub member, elastic means coupling said members together in radially spaced relationship and permitting limited radial movement of the rim member relative to the hub member, a key ring plate encircling the axis of the hub member and having a radial slide key and recess guideway connection with the hub member locking the key plate to the hub member for rotation in unison in either direction while guiding the key plate for movement relative to the hub member in a radial direction and having a radial slide key and recess guideway connection with the rim member locking the key plate to the rim member for rotation in unison in either direction while guiding the rim member for movement relative to the key plate in a radial direction at right angles to said radial direction of movement of the key plate.

3. In a strip feeding device, a feeding roll having a hub

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member and a rim member encircling the hub member, elastic means coupling said members together in radially spaced relationship and permitting limited radial movement of the rim member relative to the hub member, and a key ring plate encircling the axis of the hub member and disposed at one end of the hub member and the rim member, the key plate having on its inner face a pair of keys spaced 90° apart and the hub member and the rim member having respective guide recesses therefor extending radially in respective directions 90° apart, whereby (1) the rim member is positively locked to the key plate for rotation therewith in either direction, (2) the key plate is positively locked to the hub member for rotation therewith in either direction, (3) the key plate is guided for radial movement along the way defined by the recess in the hub member, and (4) the rim member is guided for radial movement in the guide direction of the recess on the rim member.

4. In a strip feeding device, a feeding roll having a hub member with an end extension of reduced diameter defining an end face radially beyond said extension and a rim member encircling the hub member, elastic means coupling said members together in radially spaced relationship and permitting limited radial movement of the rim member relative to the hub member, a key plate in the form of a disc ring supported over said hub extension with an annular clearance therearound, and held substantially against said hub face and against the end of the rim member, a key and guide recess connection between the inner face of said key plate and said hub face, positively locking the key plate and the hub member together for rotation in unison in either direction and having its line of guide action extending radially in one direction to allow the key plate to move radially in said direction relative to the hub member, and a key and guide connection between the inner face of the key plate and the end of the rim member for positively locking the rim member and the key plate together for rotation in unison in either direction and having its line of guide action extending radially in a direction at right angles to said first mentioned direction, to allow the rim member to move radially along the last mentioned line of action relative to the key plate.

5. In a strip feeding device, a feeding roll having a hub member and a rim member encircling the hub member, elastic means coupling said members together in radially spaced relationship and permitting limited radial movement of the rim member relative to the hub member, a key plate encircling the axis of the hub member and disposed at one end of the hub member and the rim member, two key and guide recess connections between the key plate and the end of the hub member adapted to lock positively the key plate and the hub member together for rotation in unison in either direction, and arranged in diametrical opposition with a common line of guide action extending diametrically in one direction, to allow the key plate to move radially in said direction relative to the hub member, and two key and guide recess connections between the key plate and the end of the rim member adapted to lock positively the rim member and key plate together for rotation in unison in either direction and arranged in diametrical opposition with a common line of guide action extending diametrically in a direction at right angles to said first mentioned direction, to allow the rim member to move radially along the last mentioned line of action relative to the key plate.

6. In a strip feeding device, a feeding roll as defined in claim 5, wherein there is provided a duplicate key plate at the opposite end of the hub member and rim member, duplicate key and guide recess connections between the duplicate key plate and the hub member, and duplicate key and guide recess connections between the rim member and the hub member.

7. In a strip feeding device, a feed roll having a shaft of rigid material and a rim member of rigid material en-

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circling the shaft, elastic means around the shaft resiliently supporting the rim member for limited bodily radial movement with respect to the shaft, and a lock member having a radial slide key connection with the rim member as well as a radial slide key connection with the shaft, the two said key connections being spaced 90° apart, one permitting the rim member to move in a pure radial direction only with respect to the lock member, and the other permitting the lock member to move in a pure radial direction only with respect to the shaft.

8. In a strip feeding device, a feed roll having a shaft and a rim member encircling the shaft, elastic means around the shaft resiliently supporting the rim member for limited radial movement with respect to the shaft, and keying means positively locking the rim member against circumferential displacement in either direction

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with respect to the shaft and guiding the rim member for radial movement relative to the shaft in a direction substantially at right angles to the direction of feed of the strip, said keying means comprising a keying plate around the axis of the shaft, locked for rotation with the shaft and having a radial slide key and recess guideway connection with the rim member.

References Cited in the file of this patent

UNITED STATES PATENTS

437,208	Kinney -----	Sept. 30, 1890
615,906	Richardson -----	Dec. 13, 1898
2,085,323	Leash -----	June 29, 1937
2,276,494	Kellogg -----	Mar. 17, 1942
2,715,024	Nydegger -----	Aug. 9, 1955