

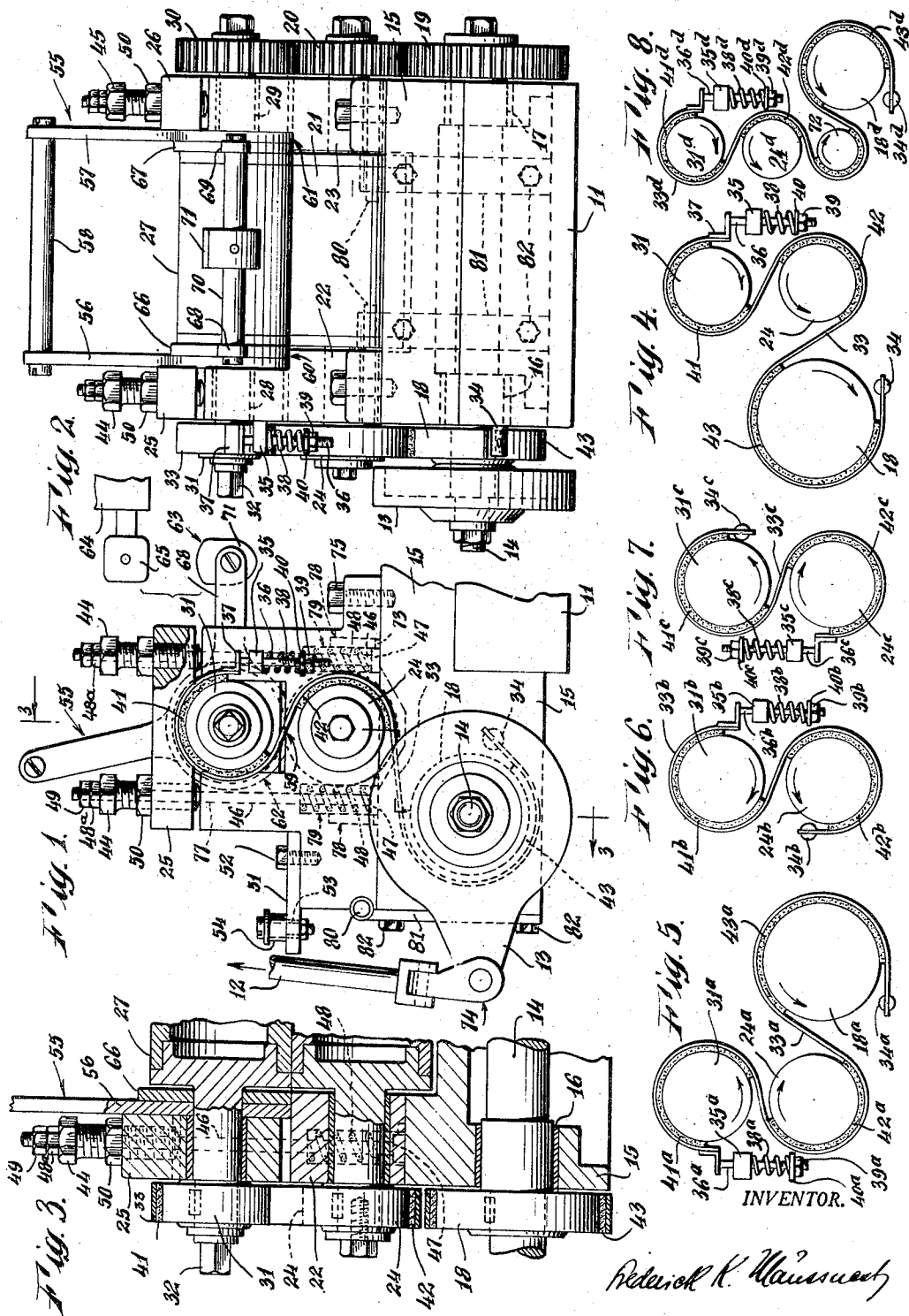
April 3, 1951

F. K. MAUSSNEST

2,547,828

BRAKING SYSTEM FOR INTERMITTENT FEED APPARATUS

Filed Dec. 18, 1947



UNITED STATES PATENT OFFICE

2,547,828

BRAKING SYSTEM FOR INTERMITTENT
FEED APPARATUSFrederick K. Maussnest, Queens Village, N. Y.,
assignor to Hedwig Maust, Queens Village, N. Y.

Application December 18, 1947, Serial No. 792,503

11 Claims. (Cl. 271-2.4)

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The present invention relates generally to an improved braking system for rolls or shafts in machine tools, and more particularly to its application to automatic feeding mechanisms for punch presses and other forms of metal working and metal forming machines, which will intermittently feed the material between the punch and die of the machine in timed relation to its stroke.

The primary object of the invention is to provide one single continuous braking system for two or more rotating rolls or shafts.

Another object is to provide the intermittently revolving shafts of automatic roll feeds for punch presses and other metal working machines with this improved continuous braking system to eliminate over-travel and to obtain extreme accuracy in feeding length.

A still further object of the invention is to provide one central adjusting point for the single continuous brake system to materially improve the accuracy of feed in intermittently actuated mechanisms of this type and to simplify at the same time the adjustment of the braking system for different feeding lengths, thus combining optimum feeding accuracy with minimum effort for adjustment.

Other objects and advantages which make this particular automatic feeding mechanism cheaper to manufacture and particularly rapid and effective in its manner of operation will become apparent during the course of the following description of the accompanying drawings wherein:

Figure 1 is a front elevation of an automatic roll feed embodying the invention and showing a portion thereof broken away to illustrate the height adjustment between the upper and lower rolls.

Figure 2 is an end view of the mechanism shown in Figure 1.

Figure 3 is an enlarged partial vertical cross-sectional view taken on line 3-3 of Figure 1 and shows in greater detail the brake arrangement for upper and lower feed rolls as well as for the drive shaft.

Figure 4 illustrates in diagrammatic form the brake arrangement for the feed rolls and drive shaft of the automatic roll feed shown in Figures 1, 2, and 3.

Figure 5 depicts diagrammatically a similar braking system for upper and lower feed rolls and drive shaft when the operating direction is reversed as compared with Figure 4.

Figure 6 shows diagrammatically the new type

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of braking system as employed in connection with an automatic feed such as shown in Figures 1 to 3, when only the upper and lower feed rolls are provided with this new brake.

Figure 7 illustrates diagrammatically a similar braking system for the upper and lower feed rolls as shown in Figure 6, but for reversed operating direction.

Figure 8 shows diagrammatically a modification of the new continuous braking system similar to that shown in Figure 4, however, with an additional intermediate shaft.

While the present invention may be applied to any mechanism or machine employing rolls or shafts which require brakes for absorbing the inertia of their masses, I have chosen to illustrate the application of this new and improved continuous braking system in connection with an automatic roll feed such as is used for punch presses and similar metal working machines.

In the drawings, wherein for the purpose of illustrating the invention, like reference characters will be employed to designate like parts throughout, reference character 11 illustrates part of a bolster or platform of a punch press (Figs. 1 and 2). The automatic roll feed is usually actuated from the crankshaft of the press, at the end of which an adjustable crank (not shown) is provided which is capable of varying the throw of connecting rod 12 for changing the length of feed. At its lower end the connecting rod 12 is pivotally connected as at 14 to a one-way clutch 13 of conventional and well-known design; its upper end is similarly connected to the aforementioned adjustable crank on the crankshaft of the press (not shown). One-way clutch 13 is keyed to one end of drive shaft 14 and is adapted to rotate this drive shaft 14 in a clockwise direction. Shaft 14 is journaled in bearings 16 and 17 of roll feed base 15 and carries brake drum 18 adjacent to one-way clutch 13. Gear 19 is keyed to the other end of shaft 14. Said feed base 15 may be fastened to bed 11 by any suitable means (not shown). Gear 20, keyed to one end of lower feed roll 21, is in mesh with gear 19. The lower roll 21 is journaled in the left and right hand housings 22 and 23, respectively, and a brake drum 24 is fast to its other end. Housings 22 and 23 are secured to base 15 by machine screws 25, hinge pins 26 coating with straps 27 secured by screws 28 as shown.

Upper left and right hand adjustable bearing blocks 25 and 26, suitably guided in respective housings 22 and 23 as shown, carry the upper feed roll 27 in bearings 28 and 29, respectively.

Gear 30 is keyed to the right hand end of roll 27 and brake drum 31 is fast to its left hand end which terminates in a square 32 for the purpose of rotating the roll feed by hand if desired by means of a wrench, or suitable crank. The gears 19, 20, and 30 are in mesh with each other, and the brake drums 18, 24, and 31 are located in the same vertical plane. Upper and lower feed rolls 27 and 21 are shown as being of the same diameter. Gears 30 and 20 have therefore the same number of teeth to rotate these rolls 27 and 21 in unison. A continuous brake band 33 is slung or wrapped around brake drums 31, 24, and 18 in a double S or sinuous shape. The lower end of brake band 33 may be suitably fastened in a slot of a pin 34 threaded or otherwise attached to base 15 of the roll feed. The other end of said brake band is spring-loaded by means of bracket 35 threaded into, or otherwise fastened to, the left hand housing 22. A pin 36 is slidably mounted in this bracket and fastened by means of an angle 37, or other suitable means, to brake band 33. The lower portion of pin 36 is threaded and carries nut 39 with spring seat 40. A spring 38 is placed in compression between said bracket 35 and spring seat 40 to keep brake linings 41, 42, and 43 in contact with brake-drums 31, 24, and 18, respectively. The brakes on all three shafts (14, 21, 27) may be simultaneously tensioned by spring 38 whose pressure may be varied by means of nut 39.

To keep their momentum to a minimum, it is general practice to make the feed rolls 21 and 27 of hollow construction as shown in Figure 3. The feed length of a roll feed must be capable of adjustment to take care of the variety of work done on a punch press. As is well known, this is accomplished by varying the throw of the previously mentioned adjustable crank on the crank-shaft of the press. Thus, the throw of connecting rod 12 is similarly varied. The resulting change in the angle of oscillation of one-way clutch 13 turns feed rolls 21 and 27 through corresponding angles which determine directly the feeding length of the roll feed for each revolution of the press shaft. Consequently, the magnitude of the momentum of the revolving masses to be braked to an absolute standstill during each press cycle varies with the feed length. With my new and improved braking system, a centralized adjustment for all revolving shafts is provided so that the setting of the brakes to obtain maximum accuracy is simple and foolproof, inasmuch as the operator has to manipulate one single spring (38) only which automatically regulates the tension on all brakes until the desired feeding accuracy has been obtained.

Various thicknesses of material have to be fed to punch presses by mechanisms of this type. Therefore, the upper feed roll 27, mounted in upper housings 25 and 26 is adapted to be raised and lowered by means of sleeves 44 and 45 which are threaded in upper housings 25 and 26 respectively, and rest on top of their respective lower housings 22 and 23, as clearly shown in Figures 1 and 2. Rods 46 extend through upper bearing blocks 25 and 26 and bores 71 of housings 22 and 23. Larger bores 79, concentric with bores 77, are arranged at the bottom of the lower housings 22 and 23 to accommodate springs 48. These springs 48 are compressed between the tops of bores 79 and heads 47 of rods 46 which preferably may be provided with projections 73 extending into vertical recesses 78 of housings 22 and 23

to prevent rods 46 from turning as shown in Figure 1. Rods 46 are threaded at their upper ends to receive nuts 48^a and lock-nuts 49. Further lock-nuts 50 coact with threaded sleeves 44 and 45. To adjust the upper roll 27 for a different thickness of material, lock-nuts 50 are loosened and threaded sleeves 44 and 45 adjusted in relation to lower housings 22 and 23 until the desired opening between upper and lower feeding rolls 27 and 21 is obtained. Then lock-nuts 50 are tightened. If the spring load on upper roll 27 is to be changed, the compression of springs 48 may be varied by loosening or tightening nuts and lock-nuts 48^a and 49, respectively.

A bracket or plate 51 may be fastened across the two lower housings 22 and 23 by means of screws 52 or the like. Plate 51 may have a transverse slot 53 in which two guide rolls 54 for guiding the work material may be mounted as shown in Figure 1. Guide rolls 54 are usually transversely adjustable in slot 53 to accommodate strips of different widths.

For lifting the upper feed roll 27, a hand-lifter 55 may be used to facilitate inserting a new strip between the upper and lower feeding rolls. Hand-lifter 55 consists of twin cam-type levers 56 and 57 interconnected by handle or cross-bar 58 and concentrically and rotatably mounted on the journals of roll 27. The actuating elements of levers 56 and 57 may be circles, such as designated by reference character 62. They may be provided at their lower ends with flat portions 59 (Fig. 1), resting on shoulders 60 and 61 of lower housings 22 and 23, respectively, when hand-lifter 55 is in inoperative position. By rotating hand-lifter 55 sufficiently in a counter-clockwise direction as viewed in Fig. 1, the upper roll 27 is lifted against the springs 48 onto the circular part 62 of levers 56 and 57, thereby increasing the opening accordingly between upper and lower feed rolls 27 and 21 to release the grip of the rolls on the stock.

An automatic lifter 63 may also be provided to lift the upper roll 27 at the end of each feeding stroke in synchronism with the reciprocating ram 64 of the punch press. To synchronize the automatic lift with the work to be done, a block 65 is usually adjustably fastened to ram 64 of the punch press in a manner well known in the art. The automatic lifter 63 is substantially the same functionally as hand-lifter 55. It may also comprise twin cam-levers 66 and 67, whose arms 68 and 69 are interconnected by cross-bar 70 carrying an element 71 which is actuated by block 65 in timed relation with the press cycle. Cam-levers 66 and 67 may also be concentrically and rotatably mounted on the journals of roll 27, adjacent to similar elements 56 and 57 of the hand-lifter 55. Circular in shape, levers 66 and 67 also possess flats resting on the shoulders 60 and 61 of lower housings 22 and 23. Thus, when ram 64 descends, block 65 will contact element 71 and thereby slightly lift the upper roll 27 so that the stock gripped between upper and lower feed rolls 27 and 21 is momentarily freed thereby allowing pilot pins or other mechanisms in the die or punch to locate the work material accurately and to insure its correct location with respect to the rolls at the beginning of the next feeding stroke. Strings 48 will cause upper roll 27 to grip the stock again as soon as ascending block 65 releases the automatic lifter element 71, because the stroke of the latter is usually so adjusted that it only sufficiently rotates the automatic lifter

63 to free the work material, but not to lift upper roll 27 onto the circular parts of cams 66 and 67.

Figures 1 to 3 show a single roll feed to pull the material from right to left through the dies. Figure 4 shows the double S brake arrangement in diagrammatic form, as well as the directions of rotation of the individual members of this particular roll feed. It therefore needs no further explanation.

Figure 5 depicts a similar double S brake system for feeding stock from left to right. In order to simplify the description, identical parts have received identical reference characters, however, with the subscript "a."

Figure 6 illustrates a single S brake as may be employed for the automatic roll feed as shown in Figures 1 to 3, if the one-way clutch should be mounted directly on lower feed roll 21 as is frequently done in practice when only short feeds are required. Corresponding parts have received corresponding numerals, however, with the subscript "b."

Figure 7 shows a single S brake for the upper and lower feed rolls similar to that of Figure 6 except that the feeding direction is from left to right. Corresponding parts have received corresponding numerals, however, with the subscript "c."

Figure 8 depicts a feed from right to left and is, therefore, similar to Figure 4. Corresponding parts have received corresponding numerals, however, with the subscript "d." To demonstrate that this continuous braking system may be used for any number of rotating shafts or rolls, an intermediate drive shaft is indicated by a brake drum 72. In a roll feed, this intermediate shaft may be required in order to increase the ratio of gearing between the actuating medium, such as one-way clutch (13) and the feed rolls (21, 27). In this case also, all four brakes may be simultaneously adjusted with the advantages pointed out previously.

While I have chosen to depict a single roll feed unit for pulling the material from right to left, such feeds may also be arranged in double fashion, namely, that one feed unit is mounted on the left hand end of the press table (11) as shown, and a similar unit on the right end of the press table. The two roll feed units, arranged in tandem between the dies, are substantially alike, but their one-way clutches are usually interconnected by means of a rod and linkages in order to transmit the oscillating movement of one-way clutch 13 to the corresponding one-way clutch of the second unit as is well known in the art.

In Fig. 4, for instance, brake drum 31, because of its clockwise rotation, tends to push brake lining 41 with brake strap 33 in clockwise direction, namely, in the same direction as the pull of spring 38. The end of lining 41 adjacent to bracket 37 will be termed the trailing end, and the other end of said lining the leading end. These terms are chosen to designate the ends of the brake linings with respect to the directions of rotation of the brake drums. Using this terminology and following the sinuous path of strap 33, the leading end of lining 43 is next to pin 34, and its trailing end is followed by the leading end of lining 42, whose trailing end in turn is followed by the leading end of lining 41. The friction between all the brake drums and linings therefore exerts a uni-directional flow of forces on the strap 33 in the direction of the pull of spring 38. Successive brake drums along

the sinuous path of the strap are shown to revolve in respective opposite directions. Similar force and rotational conditions are shown in Figs. 5, 6, 7, and 8. It should also be noted that in all the brake systems shown in Figs. 4 to 8 inclusive, the braking means or brake linings envelop the peripheries of at least two braking surfaces more than 180 degrees, thus still further increasing the effectiveness of the brake system on account of the large wrapping angles made possible by the single S and multiple S configurations. In Figs. 4 and 5, for instance, the upper and lower rolls with their brake drums 31, 24 and 31a, 24a, respectively, are located in one plane, and the drive shafts with brake drums 18 and 18a, respectively, are located in a different plane. The brake bands 33 and 33a envelop the respective brake drums in successive connected S configurations and the angle of wrap of each of these brakes is more than 180 degrees. These connected S configurations may also be called connected "double S" configurations.

In all figures, the brakes have been shown in the preferred form, arranged so that the direction of rotation of the masses supplements the spring action, i. e. that the tangential forces at the rim of the brake drum assist the spring 33 in tightening the brakes. However, if desirable, any of the pivot points 34 and spring brackets 35 may be interchanged with the possible disadvantage, however, that the moments of the revolving masses will not tend to increase the tension of the brake band and, consequently, more powerful springs may have to be employed. Instead of having one fixed point (34), a second spring similarly arranged as spring 38 may be substituted. The tightening of either spring will still result in controlling the braking pressure on all brakes.

While the several shafts of an automatic roll feed such as shown in Figures 1 to 3 are driven by a continuous gear train to accomplish the desired function of the roll feed, this condition is clearly not essential to the proper action of the new centralized braking system as disclosed, and it may be advantageously applied in other devices regardless of the relative directions of rotation of adjoining brake drums and shafts.

The brake band proper (33), or element for carrying the brake lining has been shown as one uninterrupted piece, but may be assembled from several separate parts, hinged together or otherwise suitably connected to form a continuous chain which acts as a unit when tension is exerted on it and which is adapted to transmit said tension to the brake lining of each individual brake of the system. The brake band could also be dispensed with altogether by using only a brake lining without a brake band. Moulded brake lining or woven lining reinforced with metal wires may be adapted to circumflex the brake drums or braking surfaces in the proposed sinuous path.

In contrast to brake systems employed heretofore which were neither block brakes nor band brakes, the new brake system may be employed as a pure form of band brake and results in maximum braking effort as a direct function of the spring tension. The S type brake makes it feasible to obtain an even and simultaneous braking action for the upper and lower feed rolls, controlled from a single point. The preferred embodiments shown demonstrate the further advantage that the full braking effect is instantly available without time-delay, because of the pro-

posed particular sinuous path of the braking means.

As applied to automatic roll feeds, the thickness of the work material or stock has no influence on the improved braking action. The effectiveness of brakes employed heretofore has been dependent to a great extent upon the wear of the brake lining and frequent readjustments to compensate for wear were required. It is obvious that with the new S type braking system, the wear of the brake linings has no direct influence upon the braking action. The new brake arrangement is equally effective for roll feeds working from left to right or vice-versa.

In roll feeds or other mechanisms requiring a separate drive shaft (Figs. 4 and 5) or additional intermediate shafts (Fig. 8), the new and improved braking system may be applied as a double S system, or any multiple thereof. The band brake and linings might also be described as being wrapped around the brake drums in successive reversed semi-circles, or in a sinuous path. All existing moments of the revolving masses can therefore be braked from one single central point with the result that the feeding accuracy of an automatic roll feed, for instance, may be adapted quickly and easily to any operative requirements which is of utmost importance when the roll feed is employed for high speed precision work. Despite all the advantages gained, a number of members, such as brake blocks, screws, pins, bolts, springs, etc. have been eliminated.

The type of drive for actuating the feed is usually selected according to particular requirements. While I have shown the well known one-way or over-running clutch mechanisms (13) for illustrative purposes, any other suitable mechanism may be employed such as a ratchet and pawl, a rack and pinion drive, etc.

In view of the broad scope of the invention, the terms employed herein are to be considered as descriptive rather than in a limiting sense, except for such possible limitations as may be required by the state of the prior art.

What I claim is:

1. A braking system for an automatic feed for intermittently feeding a strip of material, comprising relatively movable upper and lower feed rolls, a drive shaft, means for operatively interconnecting and intermittently rotating said rolls and drive shaft, brake drums on said rolls and said drive shaft, braking means acting substantially as a single unit for contacting each of said brake drums along more than 180 degrees of their peripheries in successive substantially reversed semi-circles in such a manner that the forces exerted by said brake drums on said braking means are uni-directional along said braking means, and adjustable tensioning means near the end of said braking means for simultaneously regulating the braking action on both said rolls and said drive shaft.

2. A braking system for an automatic feed for intermittently feeding a strip of material, comprising a pair of coacting and relatively movable feed rolls, means for intermittently actuating said feed rolls in respective opposite directions, a brake drum mounted on each of said feed rolls, braking means adapted to be wrapped around both said brake drums in successive substantially reversed semi-circles, the forces exerted by said brake drums on said braking means being uni-directional along said braking means, and adjustable tensioning means near one end of said

braking means for regulating the brake load on both said brake drums simultaneously.

3. In mechanisms comprising a plurality of rotatable members, braking surfaces on said members, braking means adapted to circumflect said braking surfaces in a sinuous path, means for rotating successive members along the sinuous path of said braking means in respective opposite directions in combination with means for displacing at least one of said members relative to the other members, whereby uni-directional braking forces will be exerted by said braking surfaces on said braking means.

4. In mechanisms comprising a plurality of rotatable members, means for moving at least one of said members with respect to the other members, braking surfaces on said members, braking means adapted to circumflect said braking surfaces in a continuous sinuous path, means for intermittently rotating successive members along said sinuous path including their braking surfaces in respective opposite directions whereby uni-directional forces will be exerted by said braking surfaces on said braking means, and adjustable tensioning means near one end of said braking means for simultaneously regulating the braking action on all said members.

5. A braking system for feed mechanisms for intermittently feeding a strip of material comprising a pair of relatively movable coacting feed rolls, means for intermittently rotating said feed rolls in respective opposite directions including means for intermittently displacing one of said feed rolls with respect to the other one, a brake drum associated with each of said feed rolls, a brake strap wrapped around said brake drums in single S configuration, means for maintaining one end of said brake strap in relatively fixed position, tensioning means acting on the other end of said brake strap, said brake strap being wrapped around said brake drums in such a manner that the tangential forces exerted by both said brake drums assist said tensioning means in tightening said brake strap.

6. A braking system for feed mechanisms for intermittently feeding a strip of material, comprising a lower feed roll, an upper feed roll coacting therewith and relatively movable thereto, means for operatively interconnecting and intermittently revolving said rolls in relative opposite directions, braking surfaces on said rolls, a brake band adapted to be wrapped around more than 180 degrees of the peripheries of each of said braking surfaces in an uninterrupted sinuous path, tensioning means acting on one end of said brake band for regulating the braking force exerted by said brake band on both said braking surfaces.

7. In a brake mechanism of the character described, relatively movable upper and lower feed rolls adapted to be rotated intermittently in respective opposite directions, a brake strap including brake lining spaced therealong for enveloping more than 180 degrees of the circumference of each of said rolls in single S configuration, said brake strap being disposed with respect to said rolls so that uni-directional braking forces will be exerted by said rolls on said brake strap, means for maintaining one end of said brake strap in fixed position, and adjustable tensioning means acting on the other end of said brake strap and adapted to exert a pull in the same direction as said uni-directional braking forces for imposing a desired braking load on both said rolls.

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8. In automatic feed mechanisms of the character described, a series of rotatable members, means for intermittently displacing one of said members with respect to the other members, braking surfaces on said members, brake lining means acting as a single unit for enveloping said members in successive connected S configurations, said brake lining means being adapted to contact at least two of said members along more than 180 degrees of their respective peripheries, means for maintaining one end of said brake lining means in relatively fixed position, and adjustable tensioning means acting on the other end of said brake lining means for regulating the braking action on all said members simultaneously.

9. In intermittent feed mechanisms of the character described, a plurality of rotatable members spaced in close proximity, at least one of said members being movable with respect to the other members, a brake band wrapped around successive members and adapted to envelop more than 180 degrees of the peripheries of at least two of said rotatable members, means for maintaining one end of said brake band in substantially fixed position, and yieldable tensioning means connected to the other end of said brake band and adapted to vary the brake load on all said members simultaneously.

10. In mechanisms of the character described, a series of three rotatable members, two members of said series being disposed in one plane and the third of said members being located in a different plane, means for moving one of said first mentioned two members with respect to the other member, braking means acting as a single unit for enveloping said three members in a connected "double S" configuration, means for main-

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taining one end of said braking means in fixed position, and yieldable tensioning means acting on the other end of said braking means for regulating the brake load on all three members simultaneously.

11. In an automatic feed for intermittently feeding a strip of material, a lower feed roll, an upper feed roll coacting therewith, a driveshaft, means for operatively interconnecting and intermittently rotating said driveshaft and said rolls, resilient means for pressing said rolls towards each other to grip said strip, means for intermittently moving said upper feed roll with respect to said lower feed roll, a brake drum for each of said feed rolls and for said drive shaft, a brake band wrapped around all said brake drums including adjustable tensioning means to vary the brake load on all said brake drums simultaneously.

FREDERICK K. MAUSSNEST.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
345,468	Wilmott	July 13, 1886
554,587	Evans	Feb. 11, 1896
1,669,832	Marcalus et al.	May 15, 1928
1,671,527	Jones	May 29, 1928
1,740,844	Strout	Dec. 24, 1929
1,880,368	Sundquist	Oct. 4, 1932
1,991,716	Wood	Feb. 19, 1935
2,168,284	Crane et al.	Aug. 1, 1939
2,336,751	Sandberg	Dec. 14, 1943
2,469,915	Capstaff	May 10, 1949