Sept. 22, 1959 K. A. FALCK-PEDERSEN 2,905,406

COIL UNREELER

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Fig. 2.

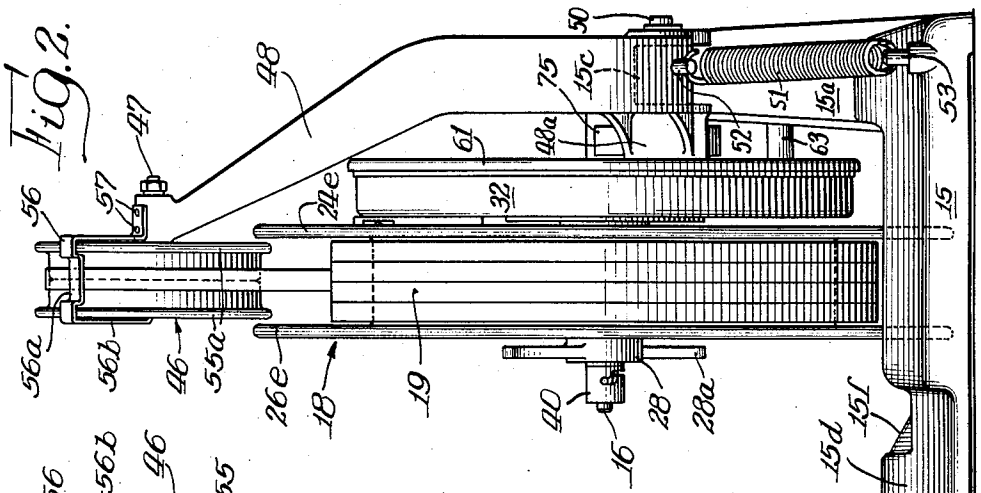
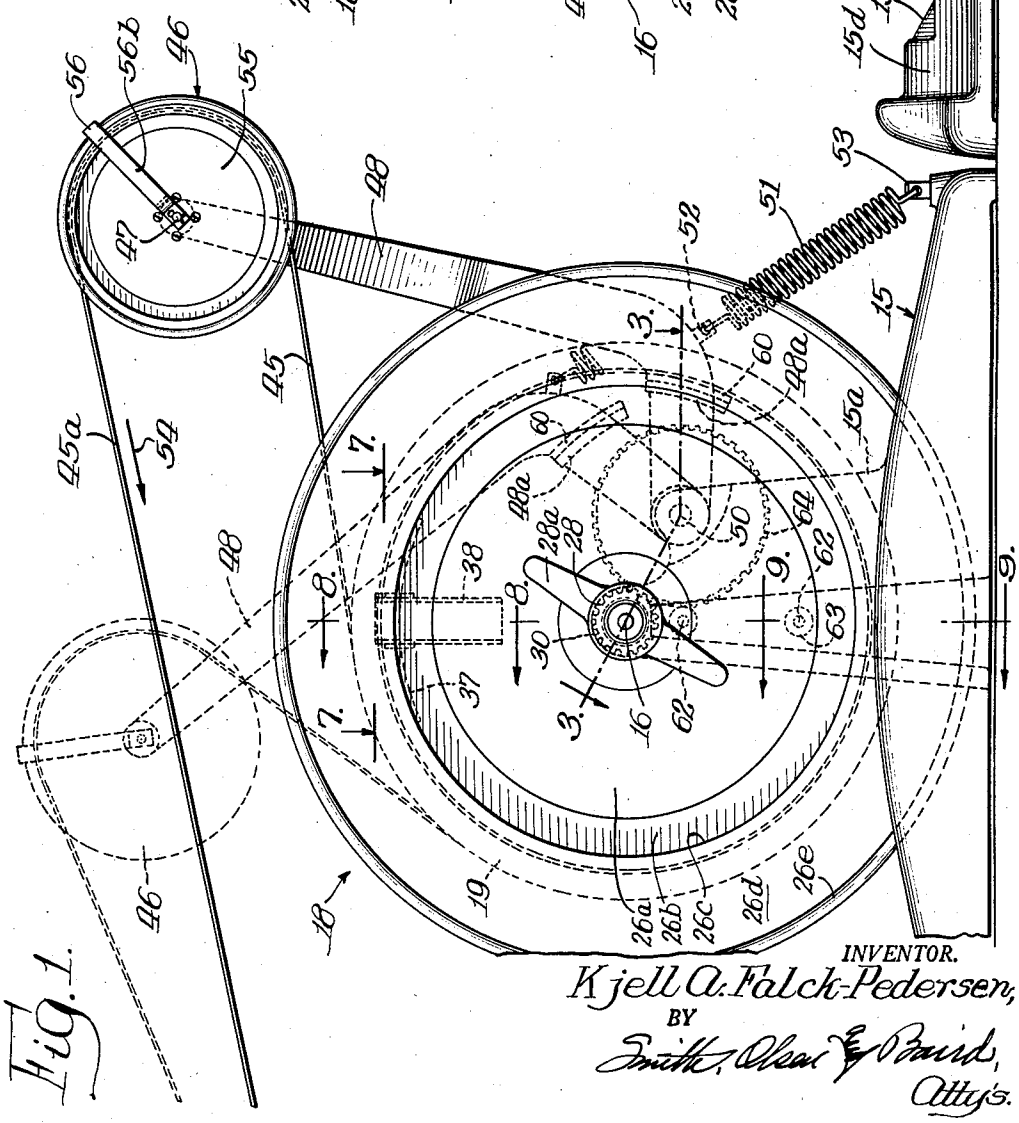



Fig. 1.




INVENTOR.

Kjell A. Falck-Pedersen,

BY

Smith, Olsen & Baird,

Atty's.

Sept. 22, 1959 K. A. FALCK-PEDERSEN 2,905,406

COIL UNREELER

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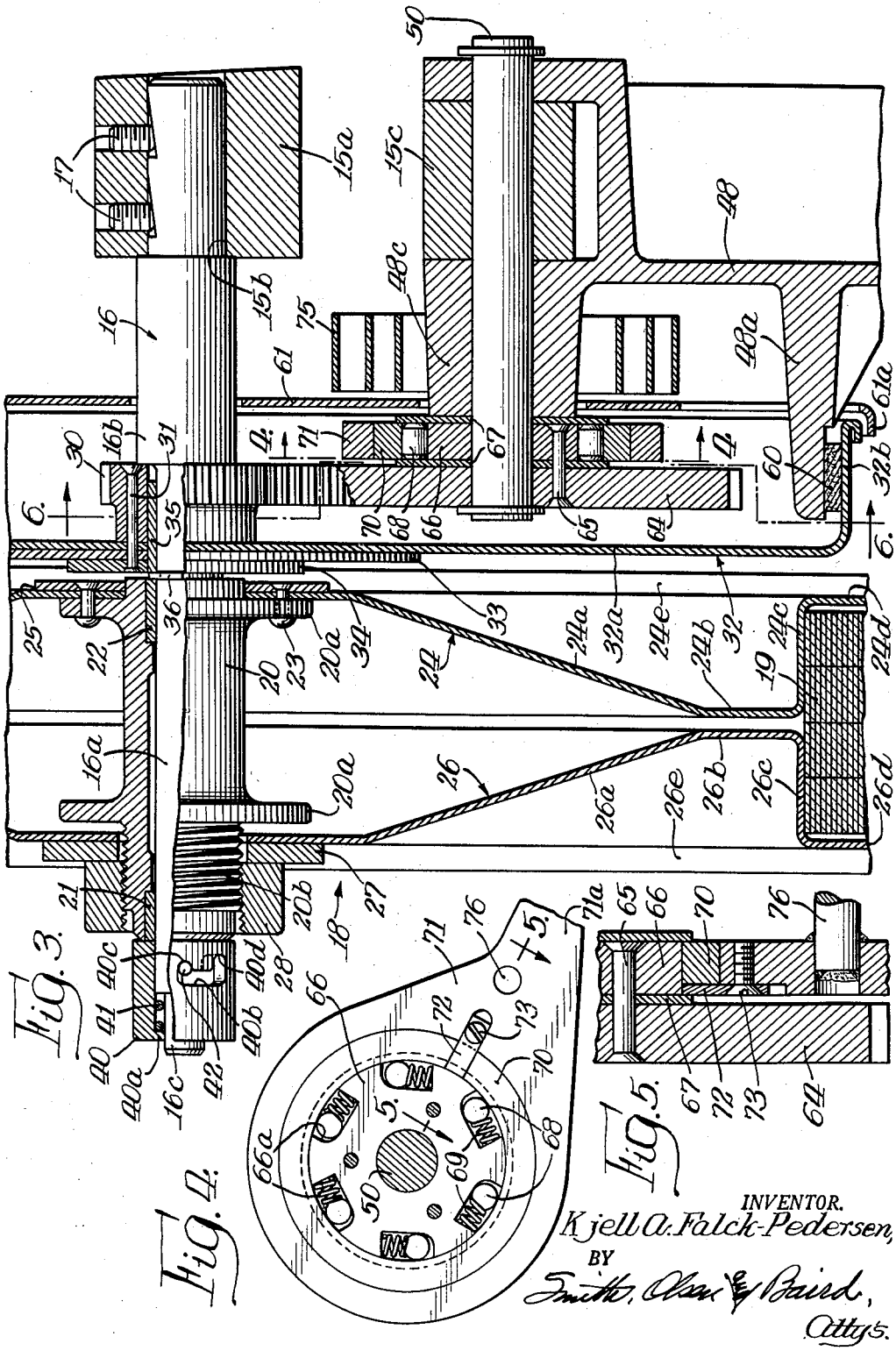


Fig. 3.



Fig. 4.



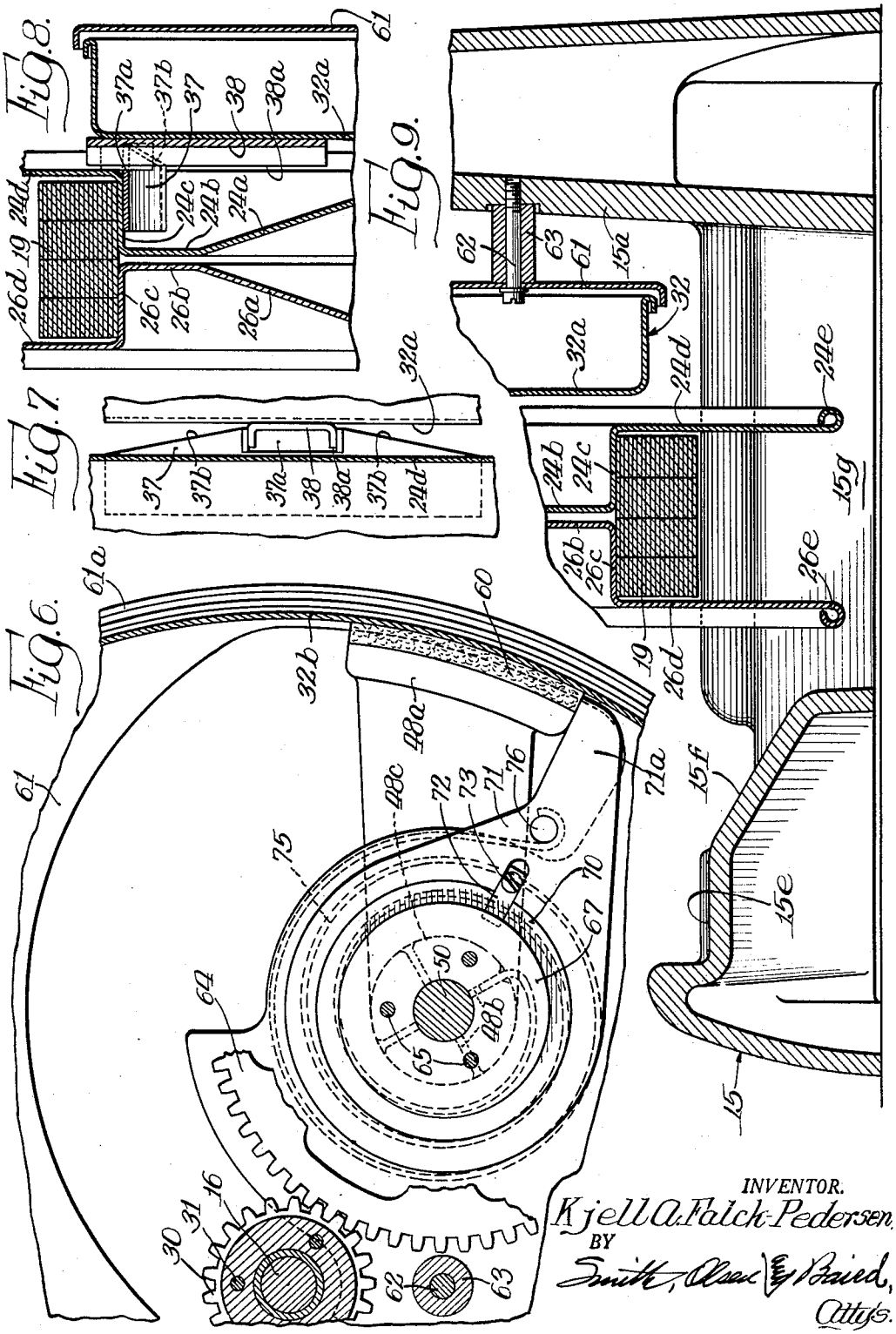
Fig. 5.

INVENTOR.
Kjell A. Falck-Pedersen,
BY
Smith, Olson & Baird,
Attys.

Sept. 22, 1959 K. A. FALCK-PEDERSEN 2,905,406

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INVENTOR.
Kjell A. Falck-Pedersen
BY
Smith, Olsen & Baird,
Attys.

Sept. 22, 1959 K. A. FALCK-PEDERSEN 2,905,406

COIL UNREELER

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Fig. 10.

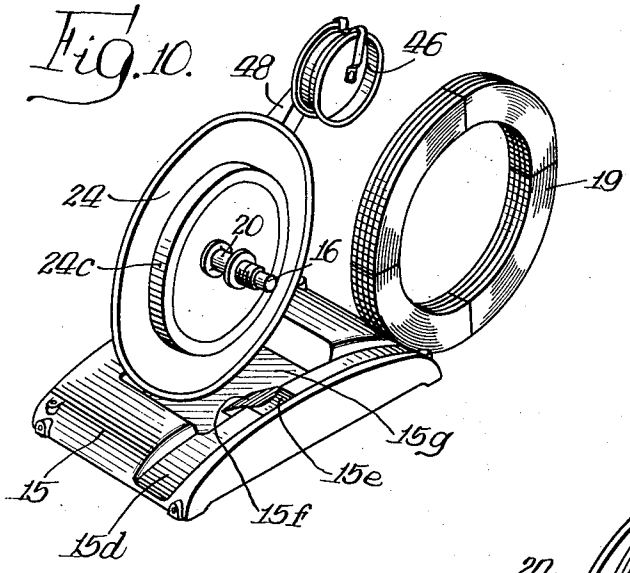



Fig. 11.

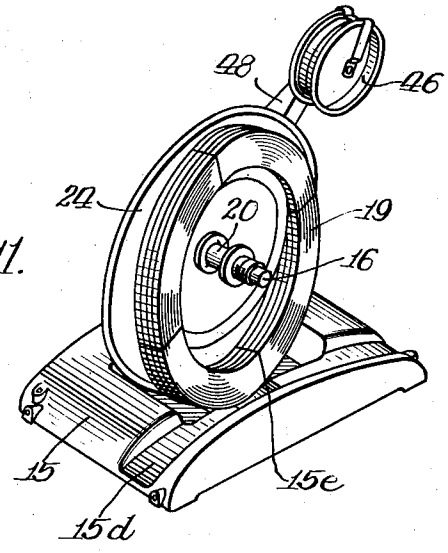
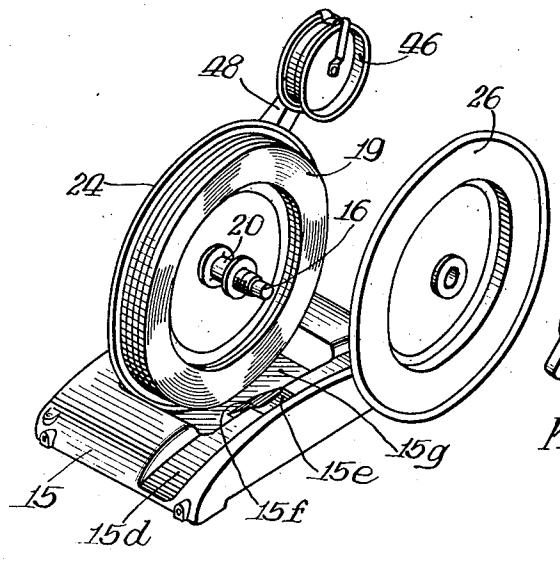
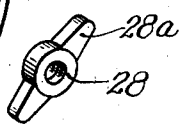



Fig. 12.




INVENTOR.
Kjell A. Falck-Pedersen,
BY
Smith, Olsen & Baird,
Attys.

United States Patent Office 2,905,406 Patented Sept. 22, 1959



2,905,406

# COIL UNREELER

Kjell A. Falck-Pedersen, Cicero, Ill., assignor to Acme Steel Company, Chicago, Ill., a corporation of Illinois

Application April 28, 1953, Serial No. 351,701

3 Claims. (Cl. 242—75.43)

This invention relates to improvements in coil unreelers and its purpose is to provide improved apparatus by which a coil of flexible binding material or the like, such as steel strapping, may be withdrawn from a coil of such material as it is needed for use in a strapping machine or other device.

When flexible strip material, such as steel strapping, is withdrawn from a rotatable coil for use according to the usual practice, two difficulties are encountered. One of these is that the inertia of the heavy coil must be overcome at starting so that the withdrawal does not begin readily and the other difficulty is that, once the rotation of the coil is started, the coil continues to rotate due to its own momentum and continues to overrun after the desired length of strip material has been withdrawn, with the result that a quantity of slack or loose material is removed from the coil and has to be rewound after the desired length has been cut off.

The principal object of the present invention is to overcome the first of the above mentioned difficulties by providing an improved coil unreeler by which a quantity of strip material is held in a slack condition and may be withdrawn for use at the beginning of the withdrawal operation without overcoming the inertia of the coil of material, in combination with means by which the rotation of the coil is started while the initial supply of slack material is being withdrawn so that the withdrawal may be continued as the coil rotates until the desired length has been removed. Another object of the invention is to provide means for overcoming the second of the difficulties referred to above by causing the rotation of the coil of material to be instantly stopped when the desired length of material has been withdrawn so that there is no excess of strip material which has to be rewound. A further object of the invention is to provide an improved coil unreeler by which the initial pull on the strip material to be withdrawn from a coil produces immediately a quantity of slack material while at the same time releasing the coil and initiating its rotation so that the withdrawal may be continued after the slack portion has been withdrawn. A further object of the invention is to provide novel means by which the rotation of the reel carrying the coil of strip material may be controlled and automatically arrested. Still another object of the invention is to provide an improved construction of a supporting reel for carrying the coil of material in conjunction with improved mechanism for actuating the reel and for controlling its rotation. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment of the invention is illustrated. In the drawings,

Figure 1 shows a side elevation of the improved coil unreeler of the present invention;

Fig. 2 shows an end elevation of the apparatus illustrated in Fig. 1, looking toward the left as viewed in Fig. 1;

Fig. 3 shows an enlarged sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 shows a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 shows a sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 shows a partial sectional view taken on the line 6—6 of Fig. 3;

Fig. 7 shows a sectional view taken on the line 7—7 of Fig. 1;

Fig. 8 shows an enlarged sectional view taken on the line 8—8 of Fig. 1;

Fig. 9 shows an enlarged vertical section taken on the line 9—9 of Fig. 1;

Fig. 10 shows a perspective view of a portion of the coil unreeler with a part of the supporting reel removed and with a coil of strip material shown in position to be moved on to the base of the apparatus preliminary to being put in position on the reel;

Fig. 11 is a perspective view similar to that of Fig. 10 showing the relative positions of the parts after the coil of strip material has been moved to a position where it is partially in engagement with a part of the reel; and

Fig. 12 is a perspective view similar to that of Figs. 10 and 11 illustrating the relative positions of the parts after the coil of material has been placed on a part of the reel in readiness to be engaged by the remaining part of the reel which is shown in proximity thereto together with its clamping nut.

As illustrated in the drawings, the invention is shown as comprising a supporting base 15 adapted to rest upon a floor or other support and having an upstanding pedestal or standard 15*a* by which the movable parts of the apparatus are carried. This pedestal is provided with a horizontal bore 15*b* in which there is mounted the reduced extremity of a horizontal shaft 16. This shaft is secured in stationary position by setscrews 17 which engage threaded apertures in the pedestal and contact with flat surfaces on the side of the shaft which are formed by milling transverse recesses therein. On the projecting portion of this shaft 16 there is mounted a reel 18 adapted to carry a coil of strip material 19, such as steel strapping, which is adapted to be withdrawn by the rotation of the reel. The reel 18 comprises a hub 20 having mounted therein bushings 21 and 22 which revolve upon the portion 16*a* of the shaft. This hub has two radially extending disks 20*a* to one of which there is secured by rivets 23 one side plate 24 of the reel which is inclined axially from the hub as shown at 24*a*, thence radially outward as shown in 24*b* and thence horizontally in cylindrical fashion as shown at 24*c*. The cylindrical part 24*c* is united with an annular radial portion 24*d* which terminates in an annular bead 24*e*. The rivets 23 also secure in place a plate 25 which fits over the end of the hub 20 on the outer side of the plate 24.

The other flange 20*a* of the hub 20 is adapted to be clamped to the other side plate 26 of the reel 18, this plate comprising a part which extends radially outward from the hub 20 and an inclined portion 26*a* which converges outwardly with the part 24*a* of the other side plate. The part 26*a* is united with a radial portion 26*b* extending parallel to the part 24*b* and this radial part is united with a cylindrical portion 26*c* which is located in alignment with the part 24*c* of the other side plate so that these parts taken together provide a cylindrical support for the coil 19. The part 26*c* is united with a radial portion 26*d* which terminates in a bead 26*e* of the same diameter as the bead 24*e*.

The side plate 26 of the reel is apertured to receive the threaded portion 20*b* of the hub 20 and an annular plate 27 is secured to the plate 26 around the part 20*b* on the outer side of the plate 26. A clamping nut 28, having radiating handles 28*a*, has a threaded engagement with the portion 20*b* of the hub and may be operated to clamp the inner portion of the plate 26 against the adjacent flange 20*a* of the hub and to bring the radial portions 24*b* and 26*b* of the two side plates into close proximity with each other. When it is desired to place a coil 19 in position on the reel, in the manner hereinafter described, the nut 28 is removed and the side plate 26 detached from the hub 20 so that the coil 19 may then be placed over the part 24*c* of the other side plate 24.

For the purpose of rotating the reel 18 on the shaft 16 there is provided a pinion 30 which is rotatably mounted on the part 16*a* of the shaft adjacent to the larger portion 16*b*, between the reel and the pedestal 15*a*. This pinion is secured by rivets 31 to the radial portion 32*a* of a brake drum 32. The rivets 31 also secure the pinion 30 to two spacer plates 33 and 34 which are located on the opposite side of the portion 32*a* of the drum from the hub portion of the pinion. These connected parts have secured within their central apertures a tubular bushing 35 which revolves upon the part 16*a* of the shaft. A locking ring 36 detachably engages a groove in the shaft adjacent to the plate 34 to prevent this assembly from endwise movement and retains the pinion 30 in contact with the shoulder at the end of the part 16*b* of the shaft. The brake drum 32 terminates at its outer margin in a cylindrical portion 32*b* which provides the braking surface for arresting the rotation of the reel 18 as hereinafter described.

The driving connection between the pinion 30 and the reel 18 is established through the brake drum 32 by means of a bracket 37 secured to the part 24*d* of the side plate 24 so that it extends at right angles to a radius of the reel. This bracket is provided with a rectangular recess 37*a* adapted to be engaged by a channel-shaped locking member 38 secured to the radial portion 32*c* of the brake drum. The bracket 37 is provided with inclined surfaces 37*b* leading to the recess 37*a* and, upon relative rotation of the reel 18 and the brake drum 32, one of the flanges 38*a* of the locking member will ride over one of the surfaces 37*b* of the bracket until the parts are in interlocking engagement as shown in Fig. 7, whereby the reel will rotate with the drum.

The reel 18 is adapted to be moved into and out of interlocking engagement with the drum 32 by means of a sleeve 40 which is slidably and rotatably mounted upon the reduced extremity 16*c* of the shaft 16. This sleeve has an outer diameter which is less than that of the inner threaded bore of the locking nut 28 so that the nut and the outer side plate 26 of the reel may be removed from the hub 20 over the sleeve 40. The inner end of the sleeve 40 fits over the part 16*a* of the shaft and the outer part has an inturned flange 40*a* which fits upon the reduced extremity 16*c*. Within the bore of the sleeve 40, between the flange 40*a* and the end of the portion 16*a* of the shaft, there is mounted a helical spring 41 which tends normally to move the sleeve toward the adjacent end of the shaft. The sleeve 40 is retained on the shaft by a transverse pin 42 which is fixed in the shaft and arranged to extend radially therefrom into a slot 40*b* formed in the sleeve. This slot provides two shoulders 40*c* and 40*d* which are connected by the intermediate portion of the slot and by rotating the sleeve 40, the pin 42 may be moved into engagement with either of the shoulders 40*c* or 40*d* which are spaced different distances from the end of the sleeve. When the pin 42 is in engagement with the shoulder 40*d*, the sleeve 40 is in its retracted position and the reel 18 may then be moved out of interlocking connection with the drum 32, through the parts 37 and 38 previously described, so that the reel may then be rotated independently of the drum and the driving mechanism hereinafter described. When the sleeve 40 is moved endwise of the shaft and rotated to bring the pin 42 into engagement with the shoulder 40*c* of the sleeve, the hub 20 and other parts of the reel are then moved endwise of the shaft until the locking member 38 engages the recess 37*a* of the bracket 37 whereby the reel 18 may be rotated when the drum 32 is rotated by actuation of the pinion 30.

When the strap 45 or other flexible strip material is withdrawn from the coil 19 on the reel 18, it is extended around a pulley 46, as shown in Fig. 1, and then reversed in direction as shown at 45*a*. The pulley 46 is rotatably mounted upon a shaft 47 which is fixed in the upper end of a lever arm 48 of angular shape which has its lower angularly bent portion rotatably mounted upon a shaft 50 which is journaled in a bearing formed in a part 15*c* of the pedestal. A coil spring 51 is attached at 52 to the lever arm 48 and the other end thereof is connected at 53 to the base 15 so that the spring operates normally to hold the lever arm 48 in the position shown by full lines in Fig. 1. When a pull is exerted on the strap 45 to move it in the direction of the arrow 54 in Fig. 1, the tension in the strap operates to tilt the lever arm 48 about the shaft 50 so that it is moved toward the position shown by dotted lines in Fig. 1 with the result that a considerable portion of the strap or other strip material which is looped about the pulley 46 is initially withdrawn toward the place of use without rotation of the reel, as pointed out more fully hereinafter.

The pulley 46 is somewhat similar in construction to the reel 18, having side plates 55 which terminate in outwardly extending portions having marginal beads 55*a*. There is thus formed an annular groove in the pulley through which the strap 45 passes and the strap is retained in its position extending around the pulley by a bracket 56 which also performs the function of retaining the pulley 46 on the shaft 47. This bracket is secured by screws 57 to the upper end of the lever arm 48 and it has a part 56*a* which extends into the groove of the pulley, as well as an arm 56*b* which fits over the end of the shaft 47 where it is secured by a cotter pin or the like.

The lower end of the lever arm 48 has a transversely extending flange 48*a*, shown particularly in Fig. 3, which carries a brake shoe 60 adapted to coact with the inner annular surface of the flange 32*b* of the brake drum for the purpose of controlling the rotation of the drum and of the reel 18. When the lever arm 48 is in the position shown by full lines in Fig. 1, where it is normally held by the action of the spring 51, the brake shoe 60 coacts with the flange 32*b* of the brake drum to hold the reel 18 against rotation. However, when a pull is exerted on the strap 45 in the direction of the arrow 54 to rock the lever arm 48 toward the position shown by dotted lines in Fig. 1, the flange 48*a* and the brake shoe 60 are tilted away from the flange 32*b* of the brake drum so that the drum is thereby released to permit free rotation of the reel 18.

The rotation of the reel 18 and of the drum 32 is controlled and in part actuated by mechanism connected to the pinion 30 which is located in a housing formed by the drum 32 and by a cover plate 61 which has an annular flange 61*a* overlapping the edge of the flange 32*b* of the drum and which is supported from the standard 15*a* by studs 62 and spacing members 63. Within the housing thus formed, there is a gear 64 rotatably mounted upon the shaft 50 and arranged to mesh with the pinion 30. This gear is connected by rivets 65 to a clutch member 66 and to two plates 67 which are mounted on opposite sides of the clutch member and arranged to rotate therewith on the shaft 50. This clutch member 66 is provided in its outer margin with a plurality of circumferentially extending recesses 66*a*, each of which is tapered toward one end and occupied by a roller 68

normally moved toward the tapered end of the recess by a coil spring **69** mounted in the recess. These rollers are retained in the recess by an outer clutch ring **70** which is adapted to revolve on the clutch member **66** and which is itself surrounded by a clutch plate **71** secured in fixed relation thereto by a block **72** which engages registering recesses in these two members and which is secured in fixed position to the clutch plate **71** by a screw **73**. The clutch plate **71** has a radially extending arm **71***a* which projects into the path of the flange **48***a* of the lever arm **48** by which the brake shoe **60** is carried. It will be apparent that when the clutch plate **71** is tilted in a counterclockwise direction, as viewed in Figs. 4 and 6, the rollers **68** will be wedged between the clutch member **66** and the clutch ring **70** at the smaller ends of the slots so that these members will then rotate together. If the clutch plate **71** is rotated in the opposite direction, the rollers **68** are retracted against the compression of the spring **69** so that the clutch ring **70** and the clutch plate **71** are then free to rotate around the clutch member **66** independently of the gear **64**.

The clutch plate **71** is adapted to be actuated in one direction by the flange **48***a* which carries the brake shoe **60** and it is adapted to be actuated in the opposite direction by a spiral spring **75**, one end of which interlocks with one of the radially extending slots **48***b* which are formed in a hub portion **48***c* of the lever arm **48**. This spring is coiled around the hub portion **48***c* and the outer extremity thereof is attached to a pin **76** which projects laterally from the arm **71***a* of the clutch plate, as shown in Figs. 4 and 6.

When a pull is exerted on the strap **45** to move it in the direction of the arrow **54** and to swing the lever arm **48** from the position shown by full lines in Fig. 1 to the position shown by dotted lines in that figure, the flange **48***a* swings away from the annular flange **32***b* of the brake drum so that the drum is then released by the brake shoe **60** and the clutch plate **71** is free to follow the brake shoe in a counterclockwise direction as viewed in Figs. 1 and 6 so that the clutch ring **70**, tending to revolve in a counterclockwise direction, locks with the clutch member **66** through the rollers **68**, thereby causing a rotation of the gear **64** and a resulting rotation of the pinion **30**. This initiates the rotation of the reel **18** through the drum **32** so that the reel starts to revolve. Thus, at the beginning of the operation of withdrawing the strap, the lever arm **48** swings toward the left as viewed in Fig. 1 so that a quantity of strap looped about the pulley **46** may be freely withdrawn without immediately overcoming the inertia of the reel **18** and the coil **19**. But, after the brake shoe **60** has been released by the movement of the lever arm **48**, the spring **75** urges and starts rotation of the reel **18** and the coil **19**. Usually, the lever arm **48** is pulled rapidly enough by the strap being withdrawn that the clutch plate **71** lags behind the moving lever arm **48** so that the spring **75** is thereby wound tighter than initially to exert a greater rotational force. The spring **75** is preferably of such size and strength and under a sufficiently high pre-stressed initial condition that, before the lever arm **48** reaches the position shown by dotted lines in Fig. 1, the rotation of the reel will be up to a peripheral speed approximating that at which the strap is being withdrawn from the reel **18**. When this speed is attained, the clutch plate **71** will have caught up to the lever arm **48** and will remain in contact with it as long as strap is withdrawn at approximately uniform speed. During this period, the clutch member **66** will continue to overrun and rotate with the gear **64**. It should be understood that the only energy stored in the spring **75** that is utilized for rotational purposes is that imparted to it by movement of the lever arm **48** during its return movement and the energy initially stored in the spring **75** provides a sufficiently high force tending to rotate the reel **18** and the coil **19** the instant the brake shoe **60** is released.

When the strap is released, the arm **48** returns to the position shown by full lines in Fig. 1 with the result that the brake shoe **60** immediately engages the brake drum **32** and arrests the rotation of the coil, so that no excess strap is withdrawn and, at the same time, the clutch plate **71** is returned to its initial position by the engagement therewith of the flange **48***a* of the lever arm. Assuming that only a short length of strap was withdrawn from the coil **19** and that the clutch plate **71** did not have sufficient time to catch up to the lever arm **48**, after it separated from the clutch plate **71**, to wind the spring **75** more tightly, then, as the arm **48** returns, the spring **75** is thereby rewound to its initial condition. To summarize, one purpose of the clutch is to permit the return movement of the lever arm **48** without causing reverse rotation of the reel **18** through the gear **64**. Its second purpose is to permit the clutch plate **71** to again contact the lever arm **48** after the two have been separated by quick movement of the lever arm **48**. The third purpose of the clutch is to permit overrunning of the reel **18** after it has reached the speed at which strap is being withdrawn. After the lever arm **48** is returned to its initial position and the brake shoe **60** is applied, the parts are then in readiness for a succeeding operation of withdrawing a portion of strap.

To facilitate the operation of placing the coil **19** in position on the reel **18**, the present invention is preferably employed with a base **15** having the form which is illustrated particularly in Figs. 10, 11 and 12. As there shown, the base **15** extends laterally from the position occupied by the reel **18** and this portion is provided with a groove **15***d* forming an inclined ramp over which the coil **19** may be rolled from either end of the base to an intermediate position where it will rest in a curved depression **15***e*. From this depression, there is an inclined portion **15***f* which is directed downwardly and inwardly toward the recess **15***g* in which the lower part of the reel is located.

In Fig. 10 the outer plate **26** of the reel has been removed and the coil **19** is shown in position at one end of the ramp **15***d* in readiness to be rolled into position opposite the plate **24** of the reel. In Fig. 11 the coil has been moved into engagement with the recess **15***e* and has been tilted so that it overlies and engages the uppermost portion of the flange **24***c* of the plate **24**. The lower part of the coil is then pushed inwardly over the inclined surface **15***f* until the entire coil is seated on the flange **24***c* as shown in Fig. 12. The other plate **26** may then be applied as previously described and secured in place by the nut **28**. This construction of the base **15** and this method of putting the coil in position on the reel do not constitute a part of the present invention but are described and claimed in the copending application of Thomas J. Fullerton and Robert A. Rosenblum, Serial No. 351,679, filed April 28, 1953, issued as Patent 2,777,647.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

I claim:

1. A coil unreeler comprising, a reel for supporting a coil of flexible strip material, a pivoted arm having a part over which said strip material is reversely bent as it is withdrawn from said coil, a spring, drive means actuated by said spring, a one-way clutch interconnecting said drive means and said reel, said drive means and said clutch cooperating continuously to urge said reel in a direction to unreel strip material therefrom when said reel is held against rotation, a brake for normally holding said reel against rotation, said arm being arranged to swing when a pull is exerted on the strip material to allow the reversely bent portion of the strip material to be with-

drawn and substantially therewith to release said brake and to permit said drive means to drive said clutch to turn said reel.

2. A coil unreeler comprising, a reel for supporting a coil of flexible strip material, a pivoted arm having a part over which the strip material is reversely bent as it is withdrawn from the coil, drive means including a first spring, a one-way clutch interconnecting said drive means and said reel continuously to urge said reel in a direction to unreel strip material therefrom when said reel is held against rotation, a brake for normally holding said reel against rotation, said arm being arranged to swing when a pull is exerted on the strip material to allow the reversely bent portion of the strip material to be withdrawn and to release said brake to permit said drive means through said clutch to rotate said reel, a second spring acting to return said arm to its initial position when the pull on the strip material is released, and means actuated by the return of said arm to its initial position to rewind said first spring.

3. A coil unreeler comprising a frame, a first shaft mounted for rotation on said frame, a reel mounted on said shaft for rotation therewith, said reel being adapted to support a coil of flexible strip material, a second shaft rotatably mounted on said frame, an arm fixedly attached to said second shaft for pivotal movement therewith, a member mounted on said arm and receiving the strip material therearound as it is withdrawn from the coil to provide a loop thereof, a first spring connected to said second shaft, a one-way clutch interconnecting said first spring and said first shaft, said first spring continuously urging said first shaft in a direction to unreel strip material from said reel when said reel is held against rotation, a brake member mounted on said arm and engaging against said reel in one position of said arm to prevent rotation of said reel, and a second spring normally urging said arm toward said one position, said arm being arranged to swing away from said one position when a pull is exerted on the strip material to allow the strip material in the loop to be withdrawn and substantially simultaneously to release said brake to permit rotation of said reel by said first spring through said one-way clutch, said second spring returning said arm to said one position upon release of the pull on the strip material to apply said brake.

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