Jan. 16, 1934. H. H. TALBOT 1,943,748

APPARATUS FOR UNCOILING METAL STRIP

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Fig. 1.

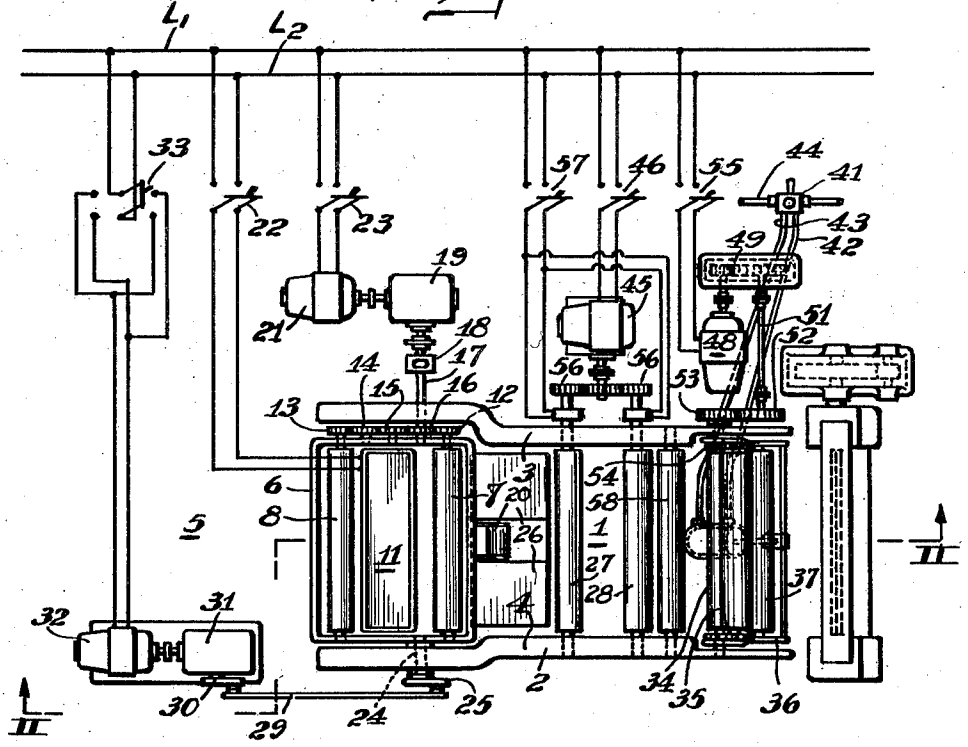
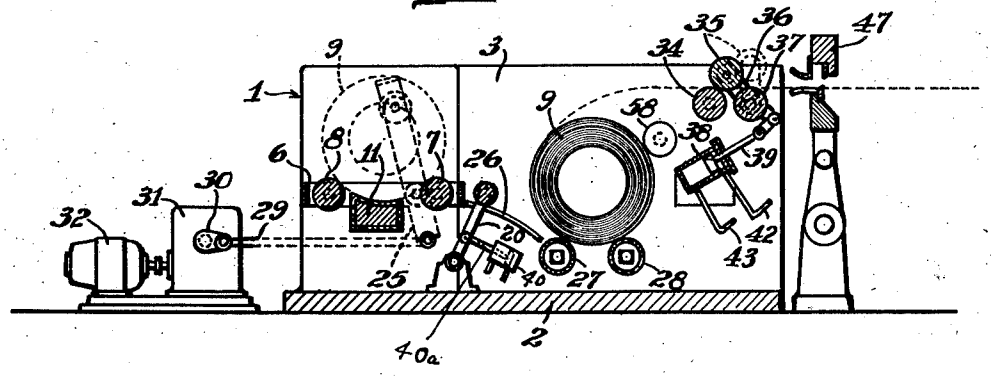



Fig. 2.




WITNESSES

A. M. Wallace.

J. E. Dickinson

INVENTOR

Howard N. Talbot

by Brown & Critchlow

his Attorneys

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Fig. 4.

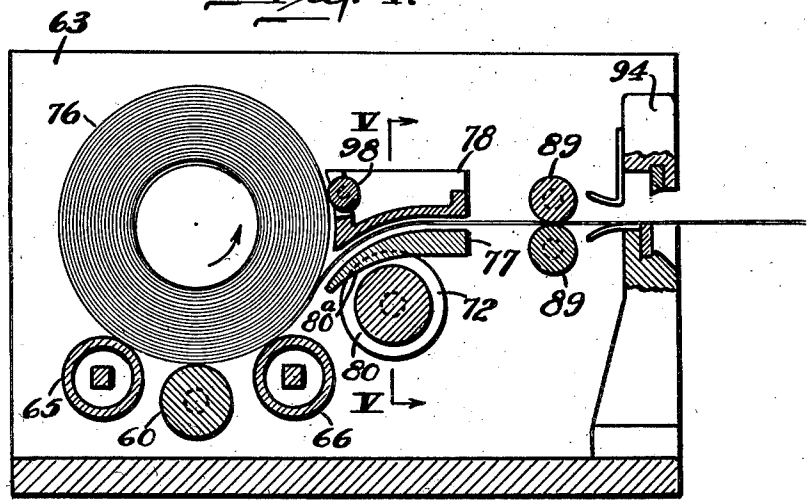



Fig. 3.

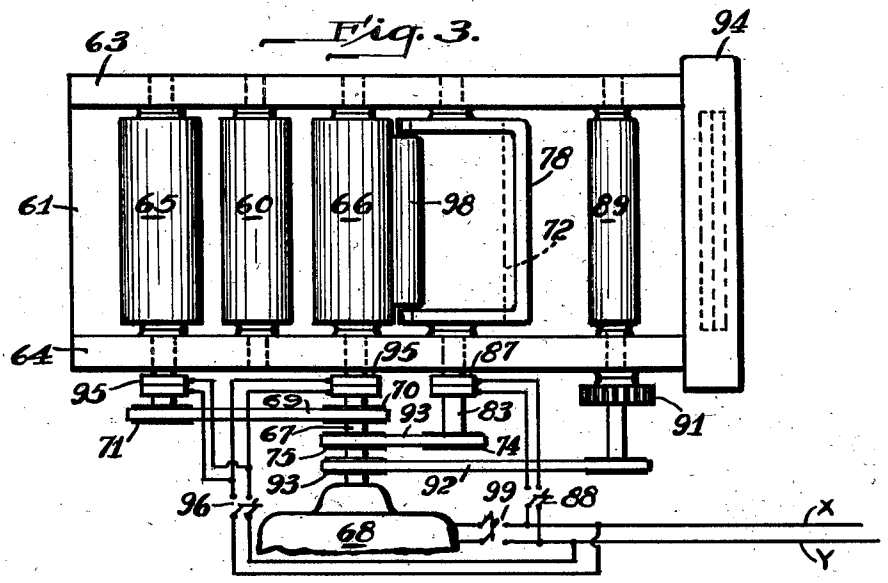
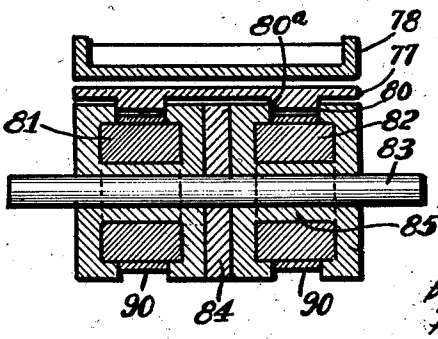



Fig. 5.




WITNESSES

R. B. Wallace.

J. E. Dickinson

INVENTOR

Howard H. Talbot

By Brown & Critchlow

his Attorneys

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# UNITED STATES PATENT OFFICE

1,943,748

## APPARATUS FOR UNCOILING METAL STRIP

Howard H. Talbot, Pittsburgh, Pa., assignor to United Engineering & Foundry Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application September 3, 1931. Serial No. 560,982

13 Claims. (Cl. 242—78)

This invention relates to apparatus for uncoiling coiled metal strip, and more particularly to an apparatus for uncoiling and delivering the strip from the coil to a metal working device.

The need for apparatus of this character is brought about by the practice in strip mills of winding the strip into compact coils by means of reels as it issues from the rolling mills, this being done to facilitate the further handling and working of the strip. Heretofore it has been the more common practice, for lack of more satisfactory and dependable means, to uncoil or initiate the uncoiling of such coils by hand. Such practice involves not only difficult and unpleasant work, particularly in the case of the heavier strips, but is also tedious and slow.

To obviate this difficulty it is the object of this invention, generally stated, to provide an apparatus for mechanically decoiling coils of the nature referred to which is of simple and sturdy construction, simple and easy to operate and which is capable of performing such operations at a considerable saving in time over the means previously employed for this purpose.

A further object is to provide an apparatus of the nature referred to which, in addition to uncoiling the coils, is adapted to feed the strip in a very convenient manner to any metal working device to which it may be desired.

These and other objects, as well as the various other novel features and advantages of the invention, will be apparent when the following detailed description is read in conjunction with the accompanying drawings, of which Fig. 1 is a plan view of one embodiment of the invention, and Fig. 2 a sectional view of the same taken on the line II—II of Fig. 1; Fig. 3 a plan view of another embodiment of the invention; Fig. 4 a sectional view of the latter taken on the line IV—IV of Fig. 3; and Fig. 5 a vertical section taken through the rotary decoiling magnet shown in the second embodiment of the invention, the section being taken on the line V—V of Fig. 4.

Referring to the embodiment of the invention illustrated in Figs. 1 and 2, the numeral 1 designates the frame of the apparatus which consists of a base portion 2 and two uprightly disposed side walls 3 and 4. In the forward end of these side walls there is provided a pivotally mounted coil supporting cradle 5 comprising a frame 6 and a pair of rolls 7 and 8.

The purpose of this cradle is to rotatably support a coil to be uncoiled, such as coil 9, over an electric magnet 11 located below and substantially midway between its rolls 7 and 8. This magnet is employed to magnetically attract and strip the outer end from the rest of the coil when the latter end is disposed substantially directly above the magnet and the magnet is energized. For rotating the coil to bring the outer end thereof into registration with magnet 11, gears 12 and 13 are keyed to the necks of rolls 7 and 8, respectively, and connected by idler gears 14 and 15 with a driving gear 16. Gears 14 and 15 are suitably mounted in frame 6 between gears 16 and 13 to give the latter the same directional rotation as gear 12. Gear 16 is mounted on a drive shaft 17 which is extended through a suitable bearing in wall 3 and connected through a clutch 18 and a gear reducing unit 19 with a motor 21.

For supplying electrical power to the apparatus a pair of line conductors $L_1$ and $L_2$ are provided and to these the windings of magnet 11 are connected by a switch 22. Motor 21 is likewise connected to conductors $L_1$ and $L_2$ by a switch 23.

The magnet 11 is preferably spaced sufficiently below the coil 9 to draw the end of the strip to it without exercising such a force upon the whole coil that the latter can not be readily removed from the cradle. After the magnet is energized and the end of the coil attracted thereto, the coil is discharged from the cradle by rotating the latter about its pivotal supports which consist of shaft 17 and a stub shaft 24 that is extended from frame 6 through side wall 4 at a point directly opposite shaft 17. This stub shaft is rigidly connected to frame 6 and has a crank 25 keyed on its outer end which is employed for tilting the cradle. When the cradle is tilted by it in the manner shown by the dotted lines in Fig. 1, the coil rolls off it due to gravity and over a run-out table 26 provided between walls 3 and 4 of the frame onto a pair of rolls 27 and 28 also mounted between and suitably supported in walls 3 and 4, the table being curved to prevent injury to the stock and aid in flexing it over the coil when released by the magnet.

To facilitate the tilting of the cradle by crank 25 the latter is connected by a connecting rod 29 with a crank 30 that is in turn connected through a gear unit 31 with a reversible motor 32. This motor like motor 21 is connected to conductors $L_1$ and $L_2$ but through a reversing switch 33 which when thrown in one direction causes the motor to operate in a direction to tilt the cradle and when in the other to cause it to return the cradle to its normal position of rest over the magnet. This cradle-tilting mechanism may be utilized to hold the cradle in its lowered or normal position, or suitable stops may be located on the frame of

the apparatus below the cradle for such purpose.

To retard the movement of coil 9 from cradle 5 onto the uncoiling rolls 27 and 28 a pivotally mounted decelerating guide lever 20 is provided, being arranged for movement in a slot in table 26 from a point above to the level of the table. A pressure cylinder 40 is provided for controlling the movement of this lever, its piston being connected thereto by a connecting rod 40a and is adapted to function as a dash pot on the down stroke of the lever and as a motor on the up stroke, suitable valves (not shown), and a source of fluid pressure being provided for this purpose.

With the moving of the coil away from the cradle after its outer end is engaged by the magnet as referred to, the outer layer of the coil is stripped from the rest of the coil in readiness for further uncoiling operations. For completing the uncoiling operation and delivering the strip from the apparatus, a pair of pinch bolts 34 and 35 is located to the rear of rolls 27 and 28 and sufficiently near the top of the frame to form a roll pass which is substantially in line with the top of the average coil to be unwound. In order to facilitate the engagement of the end of the strip in rolls 34 and 35 the upper of these is mounted in a pivotally supported frame 36 which, as shown, may be mounted on the necks of a run-out roll 37. To engage the strip between the rolls, roll 35 is raised to the position shown by the dotted lines until the end of the strip is placed on roll 34, then it is returned to its operating position. For moving roll 35, a cylinder and piston 38 are employed, the piston being connected by a rod 39 with the lower end of frame 36. To control the operation of cylinder 38 a valve 41 is connected to the ends of two pipes 42 and 43 which connect the opposite ends of the cylinder to a source of pressure supply 44.

To feed the end of the strip pulled from the coil by magnet 11 into rolls 34 and 35, rolls 27 and 28 are suitably coupled to a driving motor 45. This in turn is connected by a switch 46 with line conductors $L_1$ and $L_2$, while for driving pinch rolls 34 and 35 a motor 48 is connected through a gear unit 49, a shaft 51 and gears 52 and 53 with the shaft of roll 34. The rolls themselves carry cooperating gears 54 which mesh when the rolls are engaged, and like the other motors, motor 48 is connected to line conductors $L_1$ and $L_2$ by a switch 55. In addition the positions of rolls 34 and 35 with respect to roll 36 are so related as to cause the rolls to also function in the capacity of straightening rolls so as to smooth out any roughness which may occur in the stock.

In some installations it may be necessary to utilize electro-magnets in rolls 27 and 28 in order to insure the stripped end of the coil being carried about the coil to roll 34 when the rolls are rotated. Where such are used, as shown here, they may be electrically connected through slip rings 56 and a switch 57 with line conductors $L_1$ and $L_2$. An idler roll 58 may also be arranged at the rear of roll 28 midway between it and roll 34 to function as a stop for the coil and to aid in controlling the coil as it is unreeled.

The complete operation of the apparatus is as follows, assuming the machine to be fully deenergized, and cradle 5 in its normal operating position and the upper roll of the pinch rolls in its elevated position to which position it is returned after every uncoiling operation. A coil 9 is placed by any suitable means such as by a crane, on cradle 5 with its spirals in the proper direction. Switch 23 is then closed and clutch 18 engaged. As soon as the outer end of the coil is approximately over magnet 11, switch 22 is closed and clutch 18 disengaged. With the engagement of the end of the strip by the magnet, switch 33 is thrown to operate motor 32 in a direction to tilt cradle 5 to the dotted position shown in Fig. 2. This causes the coil to roll over table 26 onto rolls 27 and 28, being positively stopped on these rolls by roll 58. Switch 46 is then closed, starting motor 45 to rotate rolls 27 and 28; at the same time switch 57 is closed to magnetize the latter rolls if magnetic types of rolls are employed. As soon as the coil starts to rotate, switch 22 is opened deenergizing magnet 11, whereupon the free end of the coil which is flexed springs upward and is carried up over the top of the coil onto roll 34. The valve 41 is then operated to move roll 35 against roll 34. Simultaneously with this operation or slightly before, roll motor 49 is set in motion by closing switch 55, and the strip thereafter fed continuously into shears 47 or whatever other metal work device the apparatus is used with.

With the completion of the uncoiling operation roll 35 is returned to its upper position and motor 45 deenergized placing the apparatus in readiness for future operations, and as is obvious, a following coil may be placed on cradle 5 and prepared for decoiling while a preceding coil is being unreeled from rolls 27 and 28.

Referring now to the embodiment of the invention shown in Figs. 3, 4 and 5, the reference character 61 designates the frame of the decoiler which, as in the former apparatus, may consist simply of a base portion 62 and side walls 63 and 64. In the forward end of this frame there is arranged a pair of coil supporting rolls 65 and 66 which are fitted in suitable bearings in walls 63 and 64 and connected by a shaft 67 with a driving motor 68, a belt 69 being extended from a pulley 70 on this shaft to a pulley 71 provided on the end of the shaft carrying roll 65. Between rolls 65 and 66 an idler roll 60 may be provided for engaging the coil as it is unreeled.

Forward of roll 66 a rotary magnet 72 is provided, being suitably supported in bearings between frame walls 63 and 64 and arranged to be rotated by a belt 93 which is extended about pulleys 74 and 75, respectively, located on the shafts of the rotary magnet and the driving motor. This rotary magnet is arranged with respect to rolls 66 in such a position as to most effectively attract the outer end of a coil 76 mounted on rolls 65 and 66 and to guide it into a guideway formed by a pair of guide plates or members 77 and 78 when the coil is rotated in a counterclockwise direction in the manner indicated. To prevent interference of the operation of the magnet by the guide plates, the latter are preferably made of non-magnetic material and the lower one carried somewhat over the top of the magnet so that the strip slides thereover instead of contacting with the face of the magnet. To minimize the amount of the guide disposed between the face of the magnet and the coil whereby cutting down the air gap between the magnet and coil, the face of the magnet may be provided with grooves 80 and guide 77 equipped with strengthening ribs 80a which fit in such grooves.

While other forms of rotary magnets may be employed for this purpose, the one shown consists of two round magnet sections 81 and 82 mounted end to end on a shaft 83, being spaced apart to divide the points of magnetic attraction of the magnet by a non-magnetic disk 84 and each con-

sisting of a spool shaped core 85 and axially disposed windings, the periphery of which is supported by non-magnetic bands 90. For connecting the windings of the magnet to a suitable source of current supply X and Y, a pair of slip rings 87 is provided on shaft 83 exteriorly of wall 64 and these connected through a switch 88 with the power supply. The main requirement of the magnet is that it have sufficient capacity to pull the strip end free from the coil as it is rotated therepast by rolls 65 and 66 and direct it into guides 77 and 78. From the guides the strip is fed into a pair of pinch rolls 89 geared together by gears 91 and driven by a belt 92 from a pulley 93 on shaft 67. From the pinch rolls the strip may be fed to any device desired such as a shear 94.

For certain types of work it may be desirable to employ magnets in rolls 65 and 66 and if such is done these may be connected by slip rings 95 mounted on the shafts of these rolls through a switch 96 with conductors X and Y. In order to prevent magnet 72 from pulling the coil against the forward end of the upper guide member 77 in such a way as to interfere with the uncoiling operation, a small roller 98 may be mounted at that point on this guide.

The operation of this decoiler is as follows: a coil is placed on rolls 65 and 66 and motor 63 is set in motion by closing switch 99. At the same time the rotary magnet 72 and rolls 66 and 68 are energized by closing switches 88 and 96. As soon as the end of the coil arrives at a point opposite magnet 72, it is sprung away from the rest of the coil and engaged in the guides 77 and 78 from where it is carried into pinch rolls 89 due to the continuous rotation of magnet 72 and rolls 65 and 66. When the strip is engaged by the pinch rolls the rotary magnet may be deenergized if desired. If necessary a current varying means may be provided to vary the speed of the motor whereby causing the motor to run slow until the end of the strip is engaged by the pinch rolls and then speed it up for the remainder of the uncoiling operation. Such means is so well known in the art that it is deemed unnecessary to illustrate or further refer to it here.

The advantage of apparatus constructed in accordance with this invention will be readily appreciated by those skilled in the art and obviously the construction thereof may be varied without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In an apparatus for uncoiling a coil of metal strip, the combination of a coil support, means for rotating a coil mounted on said support means, means arranged adjacent said support for engaging the end of the strip at the periphery of the coil when it is rotated into registration therewith, and means for effecting relative movement between said end engaging means and the coil to separate the strip therefrom.

2. In an apparatus for uncoiling a coil of permeable metal strip, the combination of a coil support, an electro-magnet adjacent to said support for engaging the outer free end of a coil of strip supported thereby, and means for effecting relative movement between the coil and its magnetically engaged end to separate the latter from the former.

3. In an apparatus for uncoiling a coil of permeable metal strip, the combination of a coil support, means for rotating a coil mounted on said support about its axis, an electro-magnet arranged adjacent said support and adapted to attract the free end of the coil to it, means for effecting relative movement between said magnet and coil to separate the strip from the coil after the free end thereof is engaged by the magnet and means for controlling the energization of the magnet.

4. In an apparatus for uncoiling a coil of permeable metal strip, the combination of a coil support, means for rotating a coil mounted on said support about its axis, an electro-magnet arranged adjacent said support and adapted to grip the outer end of the coil when the latter is moved to a position adjacent the magnet and means for moving the coil from said support to separate its free end when engaged by the magnet from the rest of the coil.

5. In an apparatus for uncoiling a coil of permeable metal strip, the combination of a pivotally mounted coil supporting cradle, a pair of power-driven rolls in said cradle for rotating a coil mounted therein about its axis, an electromagnet arranged adjacent said cradle for gripping the free end of the coil and means for rotating said cradle to discharge the coil therefrom and separate the free end from the rest of the coil when the former is engaged by the magnet.

6. In an apparatus for uncoiling a coil of permeable metal strip, the combination of a pivotally mounted coil support, means on said support for rotating a coil mounted thereon about its axis, an electro-magnet arranged adjacent said support and adapted to grip the free end of the coil, means for controlling the energization of said magnet, means for rotating said support to discharge the coil therefrom, means for receiving and rotating the coil after it is discharged from said support, and a pair of power actuated pinch rolls arranged to receive the end of the strip separated from the coil by said magnet when the latter is deenergized and said receiving rolls are rotated.

7. In an apparatus for uncoiling coils of permeable metal strip, the combination of a pivotally mounted coil support, a pair of rolls mounted in the opposite ends of said support to facilitate the rotation about its axis of a coil mounted thereon, means for driving said rolls, an electromagnet mounted below said support and adapted to engage the outer end of the coil when moved thereover, means for controlling the energization of said magnet, a table mounted in front of said support, a pair of power actuated rolls arranged in front of said table, means for rotating said support to discharge the coil over said table and onto said power actuated rolls, and a pair of pinch rolls arranged adjacent said power actuated rolls for receiving the free end of said coil when it is moved into engagement therewith by said power actuated rolls after it is released from said magnet.

8. In an apparatus for uncoiling coils of permeable metal strip, the combination of a coil support, a magnet arranged adjacent said support and adapted to engage the free end thereof when the latter is moved into registration with it, means for moving the coil from said support to separate the free end gripped by the magnet from the rest of the coil, means for receiving and rotating the coil after it leaves the support, a pair of power actuated pinch rolls arranged to receive the free end of the coil after it is released by the magnet and moved thereinto by said rotating means and means for moving said

pinch rolls apart and together again to facilitate the engagement therebetween of the strip end.

9. In an apparatus for uncoiling coils of permeable metal strip, the combination of a coil support, a coil of permeable material mounted on said support, a magnet arranged adjacent said support and adapted to engage the free end thereof when the latter is moved into registration with it, means for moving the coil from said support to separate the free end gripped by the magnet from the rest of the coil, power actuated magnetic rolls for receiving and rotating the coil after it leaves the support and a pair of power actuated pinch rolls arranged to receive the free end of the coil after it is released by the magnet and moved thereinto by said rotating means.

10. In an apparatus for uncoiling permeable metal strip, the combination of a coil support, means for rotating about its axis a coil mounted on said support, an electro-magnet arranged adjacent to said support for separating the free end of the coil from the rest of the coil as it is rotated therepast and means for directing the free end of the coil away from said support as the latter is separated from the coil by said magnet.

11. In an apparatus for uncoiling permeable metal strip, the combination of a coil support, means for rotating about its axis a coil mounted on said support, and a rotary magnet arranged to attract and separate from the coil the free end thereof as the latter is moved past said magnet.

12. In an apparatus for uncoiling permeable metal strip, the combination of a coil support, means for rotating about its axis a coil mounted on said support, a rotary magnet arranged adjacent to said support and adapted to attract and separate from the coil the free end thereof as the latter is moved past the magnet means for guiding the strip over the magnet as it leaves the coil and a pair of pinch rolls for engaging the strip after it passes the magnet.

13. An apparatus for uncoiling coils of permeable metal strip comprising a coil support, a coil of permeable material mounted on said support, a magnet arranged adjacent said support and adapted to engage the free end of said coil when it is moved into registration therewith and means for moving the coil from said support to separate the free end thereof gripped by the magnet from the rest of the coil.

HOWARD H. TALBOT.