UNCOILER WITH SIDE SHIFT CONTROL
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6 Claims. (Cl. 242—78.6)

This invention relates to apparatus for handling sheet metal in coil form.

The invention is especially directed to apparatus for unwinding coils of sheet metal in a fabricating line such as a feeding line to a punch press, a cut-to-length line or a slitting line wherein the stock is slit into narrower widths from an initially relatively wide band and then re-coiled or sheared for further use. It is desirable in such fabricating lines that the sheet advancing to the fabricating station be maintained in accurately centered relation with the line, and this is sometimes difficult to do, especially where the coil has developed a more or less telescoped condition with some of the layers therein projecting axially with respect to the other layers. If such coil is unwound with the center or core thereof fixed laterally of the slitting line, any telescoped condition therein will result in lateral shifting of the uncoiling sheet as it feeds to the slitting station, and unless such shifting is corrected, the desired accuracy of fabricating may not be maintained.

It is a primary object of the present invention to provide coil unwinding apparatus for sheet metal for unwinding coils of sheet metal which handles the coils by clamping each successive coil between a pair of clamp members, which is of simple and rugged construction, and which incorporates a pair of separately movable clamping heads supporting the clamp members and having a control system such that both heads and the coil clamped therebetween can be quickly and easily shifted back and forth on their common supporting base laterally of the slitting line as required to maintain the uncoiling sheet centered with respect to the line.

Another object of the invention is to provide such coil unwinding apparatus wherein both the clamping action and the shifting action of the clamping heads are controlled by the same fluid pressure system, and wherein desired shifting of the heads and coil are effected through the fluid pressure system while maintaining both heads in proper clamping engagement with the coil.

It is also an object of the invention to provide such coil unwinding apparatus wherein the two clamping heads are operated by hydraulic cylinders through normally balanced application of pressure to both heads, and wherein shifting of the heads and coil is effected by temporarily reducing the pressure supply to one head while maintaining such reduced pressure at a sufficiently high level for adequate continued clamping of the coil.

Additional objects of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:
Fig. 1 is an elevational view showing unwinding apparatus constructed in accordance with the invention and looking in the direction of travel of the sheet therefrom;
Fig. 2 is an enlarged fragment of Fig. 1 showing the adjusting mechanism for one of the coil clamping members.

Fig. 3 is an enlarged fragmentary section on the line 3—3 of Fig. 1;
Fig. 4 is a partial elevational view looking at the right-hand end of Fig. 1; and
Fig. 5 is a hydraulic diagram.

Referring to the drawings, which illustrate a preferred embodiment of the present invention, the main base 10 is generally trough shaped to provide a centrally located recess 11 in which is mounted the platform 12 which initially receives the successive coils 13 from a crane, gravity feed supply line or other suitable supply means. This platform 12 has a relatively flat V-shaped upper surface for initially receiving and centering the coil lengthwise of the fabricating line, and it is adjustable vertically by a hydraulic cylinder 14 to align the coil in proper position for clamping by the pair of cone shaped clamp members 15. Telescoping guide rods 16 aid the cylinder 14 in maintaining a level position of platform 12.

The clamp members or cones 15 form parts of two coil clamping heads identified generally as 20 and 21 and each mounted independently on the main base 10 for sliding movement parallel with the axis of the coil and thus laterally of the slitting line. The main frame 22 of the heads 20 and 21 includes front and back rails 23 which slide on gibbs 24 mounted on the main base. Retaining gibbs 25 are similarly on the main base and overlap the rails 23 to retain the heads in guided sliding relation with the main base. The sliding movements of the two heads are in turn under the control of a pair of hydraulic cylinders mounted in brackets 26 at opposite ends of the main base, the cylinder 30 having its piston rod connected with the head 20, and the cylinder 31 being similarly connected with the head 21.

Each of the cones 15 is rotatably and adjustably supported by its associated head, each cone being mounted by suitable bearings on the forward end of a non-rotating spindle 33 mounted for axial adjustment in its associated head. Such axial adjustment is controlled by a hand wheel 35 driving a pinion 36 meshing with rack teeth 37 extending along the under side of the spindle 33. Locking of the spindle in adjusted relation with the head structure is effected by a lock member 40 having rack teeth 37 adapted to mesh with the rack teeth 37 and carried by a slide 41 movable in the head transversely of the spindle. The lock member is moved into and out of engagement with the rack teeth on the spindle by a lever 42 pivoted on the head at 43 and also pivoted at 44 to a link 45 secured at its inner end to the lock member 40.

In initially setting up this unit for unwinding operation, the cone 15 on the left hand head 20 is adjusted in accordance with the width of the coil to be unwound, and this adjustment is facilitated by a scale 46 which moves with the cone unit with respect to the head structure.

In addition, each of the cones 15 is provided with a suitable brake offering controlled resistance to rotation of the cone to maintain tension in the sheet. Such brake unit includes a brake band 50 secured at one end to a stud 51 on a bracket 52 and extending around a drum portion 53 of the cone to an adjusting unit indicated generally at 55.

The hydraulic system for control of the coil unwinding apparatus is shown diagrammatically in Fig. 5. A constant source of hydraulic pressure fluid is represented by a pump 60 having a drive motor 61 and drawing oil from the reservoir 62. A relief valve 65 establishes the pressure flow to a manually operated pilot valve 66 having a neutral position and a pair of operating positions in which it supplies pressure to one or the other ends of the cylinders 30 and 31 to effect initial clamping or unclamping of the coil.

The clamping pressure to the cylinders 30 and 31 flows
by way of lines 67 and 68 and a pair of adjustable relief valves 70 and 71 to the cylinders 30 and 31 respectively. Each of these relief valves is also connected by a line 72 or 73 with a manually operated pilot valve 75 similar to pilot valve 66. In the neutral position of the valve 75, there is no flow therethrough in any direction, and with the two relief valves set for the same pressure, the pressure supply will be balanced for both of cylinders 30 and 31. If this valve 75 is shifted to the right as viewed in Fig. 5, the relief valve 71 will then be connected by a line 76 with an adjustable relief valve 77, but the valve 76 will be unaffected since the port 78 of valve 75 is plugged. If the valve 75 is shifted to the left in Fig. 5, the reverse condition will be established.

In order to provide for a smooth adjusting movement of the heads, it is desirable to have a needle valve or other suitable restriction 80 in the lines 72 and 73 as shown, thus throttling the pressure drop in response to shifting of valve 75 to a sufficient extent to provide a floating movement rather than a sudden shift. Similar throttling means 81 are also provided in each of the lines 67 and 68 as shown in order to provide a restriction in the line between the cylinders 30 and 31. This throttling means 81 maintains a sufficiently choked condition in the lines to avoid possible dumping of the oil when the pressure is lowered on one side of the system. With these arrangements, the actual pressure drop during adjusting movement will normally be less than the total possible drop provided for, since the correcting action will ordinarily be completed before the total possible drop is reached.

In the operation of the invention, the relief valve 77 is set for a predetermined pressure which is appreciably lower than the setting for the two valves 70 and 71, but which is still sufficiently high to maintain proper clamping action of the two heads. For example, if the valve 65 is set for 650 p.s.i., the valve 77 may be set for 450 p.s.i. and valves 70 and 71 should be set for a sufficiently high pressure to insure that they will not operate except when one or the other is connected to valve 77 by valve 75, for example 850 p.s.i. Then when the valve 75 is shifted to the right as described, the valve 71 will be reset to relieve down to a pressure of 450 p.s.i., providing a possible total differential of 200 p.s.i. across the piston in cylinder 31. The resulting momentary unbalance of the pressure supply to the cylinders will cause both heads to move to the right as viewed in Fig. 1 while the clamping action on the coil is still maintained at an adequately high level. As the valve 75 is returned to its neutral position, relief valve 71 will be reset at its normal high setting of about 850 p.s.i., and the balanced pressures on the two cylinders will be reestablished to stop further movement of the heads.

In operation, the normal condition will be to supply balanced pressure to both cylinders 30 and 31 as described and thereby to maintain the heads stationary and in gripping or clamping relation with the coil. As the unwinding operation proceeds, whenever the operator observes that there is a telescoped condition in the coil, or if for any other reason the sheets is tending to drift out of centered relation with the slitting line, he needs only to shift valve 75 to the correct operative position to unbalance the pressure supplied to the two cylinders and thus to cause both heads and the coil to shift toward the lower pressure side. The choking action of throttling means 81 prevents any noticeable drop in pressure in both lines 67 and 68 upon opening of one or the other of the adjustable relief valves 70 and 71. Thus, when valve 70 is adjusted to relieve at the lower pressure of 450 p.s.i., by connecting lines 76 and 72 through the valve 75, the pressure in line 67 drops below the pressure in line 68 and the heads are jointly caused to move as viewed in Fig. 5. Likewise, upon shifting of valve 75 to adjust the relief valve 71 for opening at 450 p.s.i., the unbalance across the throttling means 81 results in movement of both heads 15 to the right. As soon as the sheet is again centered with the line, return of the valve 75 to neutral position checks further shifting movement.

In addition to these advantages of ease and effectiveness in operation, the invention provides an overall construction which is simple, rugged and economical. For example, since the two clamping heads are separately movable on the main base, they can be individually of compact construction minimizing the weight thereof, and this in turn makes practicable the use of a single pair of fluid pressure cylinders for effecting both clamping of the coil and shifting of the entire clamping assembly, with corresponding further economies of parts and the hydraulic system. Furthermore, with these compact clamping heads operating on a common base, they are assured of the proper operating relationships at all times while also reducing the requirements of both the weight and cost of the base.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this specific form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, cooperating means on said base and each said head supporting said heads for guided independent movement on said base laterally of the fabricating line, a pair of double-acting hydraulic cylinders connected between said base and each said head respectively for causing independent movement of said heads on said base in response to the application of pressure to said cylinders, means forming a common source of hydraulic pressure fluid for said cylinders, separate supply lines connecting said source with the clamping sides of said cylinders, a pair of main adjustable relief valves each connected in one of said supply lines and set for a pressure above the fluid pressure from said source, a third relief valve set for a lower pressure than said common source, and a control for selectively connecting one or the other of said pair of adjustable relief valves to said third relief valve to effect corresponding reduction in the pressure supply to one of said cylinders with resulting movement of both said heads and the coil on said base laterally of the fabricating line while maintaining the clamping engagement of both said clamp members with the coil.

2. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, cooperating means on said base and each said head supporting said heads for guided independent movement on said base laterally of the fabricating line, a pair of double-acting hydraulic cylinders connected between said base and each said head respectively for causing independent movement of said heads on said base in response to the application of pressure to said cylinders, means forming a common source of hydraulic pressure fluid for said cylinders, separate supply lines connecting said source with the clamping sides of said cylinders, a pair of main adjustable relief valves each connected in one of said supply lines and set for a pressure above the fluid pressure from said source, a third relief valve set for a lower pressure than said common source, and a control for selectively connecting one or the other of said pair of adjustable relief valves to said third relief valve to effect corresponding reduction in the pressure supply to one of said cylinders with resulting movement of both said heads and the coil on said base laterally of the fabricating line while maintaining the clamping engagement of both said clamp members with the coil.
movement of both said heads and the coil on said base laterally of the slitting line while maintaining the clamping engagement of both said clamp members with the coil, and means connected in the line of flow from said pair of relief valves to said third relief valve for throttling the flow of pressure fluid therethrough to cushion each said reduction in the pressure supply to either of said cylinders.

3. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, means for individually adjusting the axial position of each said clamp member on the associated said head, means for locking each said clamp member to the associated said head in each adjusted position thereof, cooperating means on said base and each said head for supporting said heads for guided independent movement on said base laterally of the fabricating line, a source of hydraulic fluid maintained at a predetermined pressure, a hydraulic cylinder connected between said base and each said head, means for connecting said source to said cylinders, control means operatively associated with said connecting means for directing said hydraulic pressure fluid to cause said heads to move toward each other on said base, and means for shifting both of said heads and the coil as a unit on said base laterally of said fabricating line including selectively operable adjustable relief valves connected with said cylinders to effect corresponding reduction in the pressure supply to a selected one of said cylinders to cause unitary movement of said heads and said coil.

4. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, means on said base providing for guided independent movement of each said head with respect to said base laterally of the fabricating line, a pair of double-acting hydraulic cylinders connected between said base and each said head respectively, means forming a common source of hydraulic fluid at a predetermined pressure for said cylinders, supply lines connecting said source to each of said cylinders for supplying hydraulic pressure to said cylinders in a direction causing said heads to move toward each other for clamping engagement of said coil by said clamp members, said supply lines having a common connection with said source, throttling means in each of said supply lines between said common connection and said cylinders, a pair of adjustable relief valves each connected into one of said supply lines between the associated throttling means and cylinder, said adjustable relief valves each being set for a pressure above the pressure of said source, and means for selectively adjusting one or the other of said relief valves to a setting below said source pressure to effect corresponding reduction in the pressure supply to the associated said cylinder with resulting movement of both said heads and the coil as a unit on said base laterally of the fabricating line while maintaining the clamping engagement of both said clamp members with the coil.

5. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, cooperating means on said base and each said head supporting said heads for guided independent movement on said base laterally of the fabricating line, a pair of hydraulic cylinders connected between said base and each said head respectively for causing independent movement of said heads on said base in response to the application of pressure to said cylinders, means for supplying balanced hydraulic pressure from a common source at the same predetermined value to both of said cylinders in the directions causing said heads to move toward each other into positions of clamping engagement between said clamp members and the coil therebetween and thereafter for continuously maintaining both of said cylinders connected with said common pressure source to retain said clamp members in clamping relation with each other and in fixed relation with said base and the fabricating line, and selective control means for partially reducing the pressure supply from said source to one of said cylinders while retaining both of said cylinders connected with said source to cause both said heads and the coil to shift on said base laterally of the fabricating line while maintaining the supply of hydraulic pressure to both of said cylinders sufficiently high to retain the clamping engagement of both said clamp members with the coil.

6. Unwind apparatus for supporting a coil of sheet material for unwinding and supply to a fabricating line, comprising a main base, a pair of opposed heads spaced apart on said base to receive the coil therebetween and each including a clamp member for engagement with the adjacent side of the coil, cooperating means on said base and each said head supporting said heads for guided independent movement on said base laterally of the fabricating line, a pair of pressure fluid operated cylinders connected between said base and each said head respectively for causing independent movement of said heads on said base in response to the application of pressure to said cylinders, means for supplying balanced fluid pressure from a common source at the same predetermined value to both of said cylinders in the directions causing said heads to move toward each other into positions of clamping engagement between said clamp member and the coil therebetween and thereafter for continuously retaining both of said cylinders connected with said connected with said source pressure to maintain said clamp members in clamping relation with each other and in fixed relation with said base and the fabricating line, throttling means in said pressure supplying means, and selective control means for creating a pressure differential across said throttling means to reduce the fluid pressure supply to one of said cylinders below said predetermined value while retaining both of said cylinders connected with said source and thereby to cause both said heads and the coil to shift as a unit on said base laterally of the fabricating line while maintaining the supply of pressure to both of said cylinders sufficiently high to retain the clamping engagement of both said clamp members with the coil.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,915,257

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December 1, 1959

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 27, for "similarly on" read — similarly mounted on —;
column 3, line 20, for "han a" read — than a —;
line 63, for "supplied" read — supplies —.

Signed and sealed this 10th day of May 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents