June 3, 1958 R. T. TODD ET AL 2,837,295

UNCOILER WITH SIDE SHIFT CONTROL

Filed Feb. 28, 1952 2 Sheets-Sheet 1

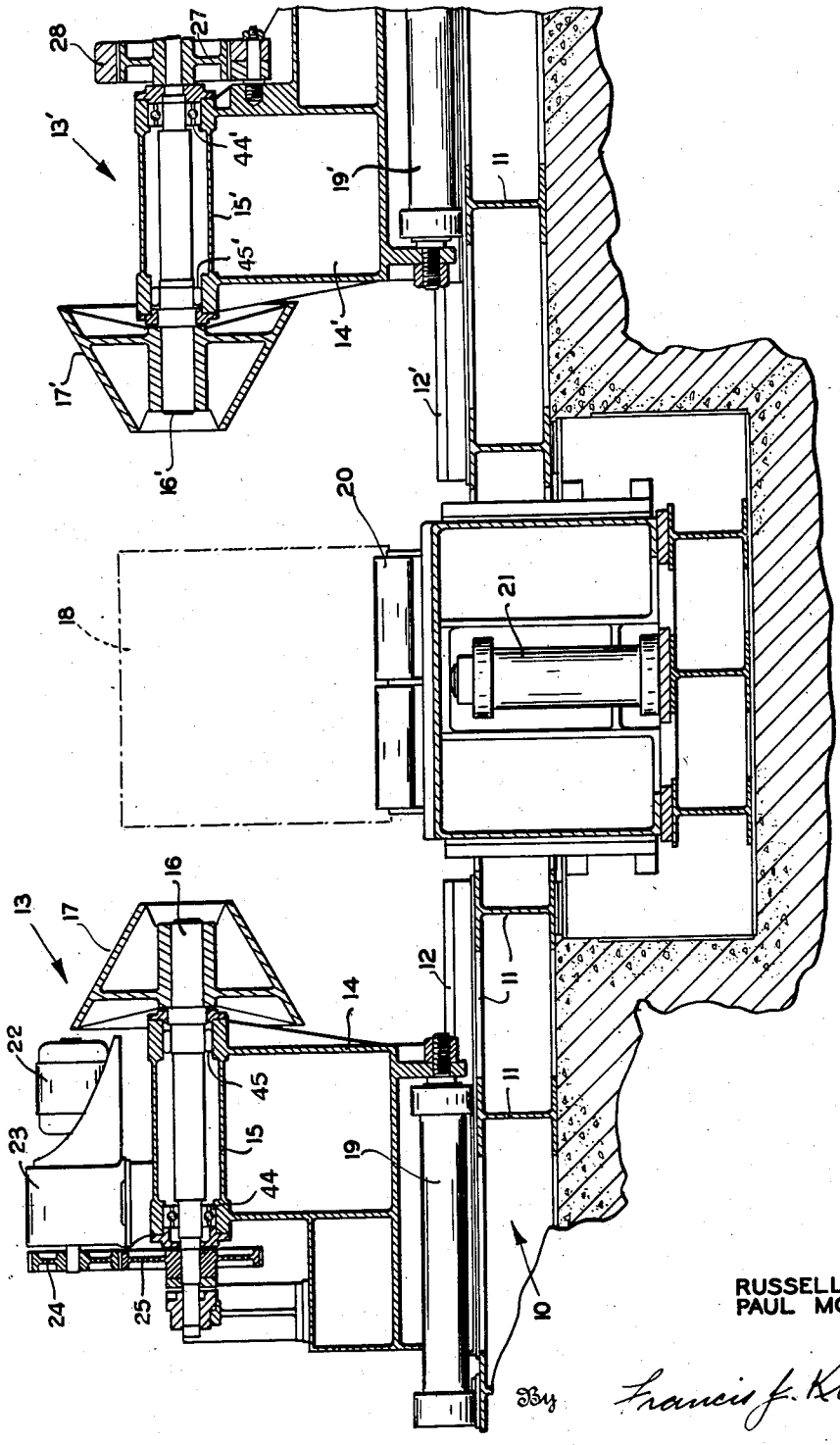

Fig. 1

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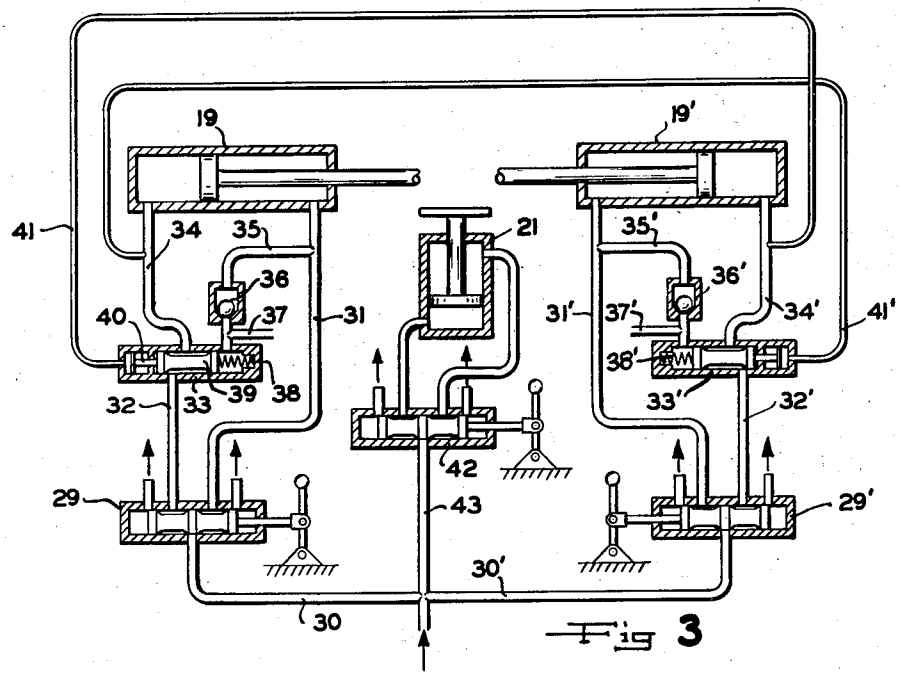

Fig 3

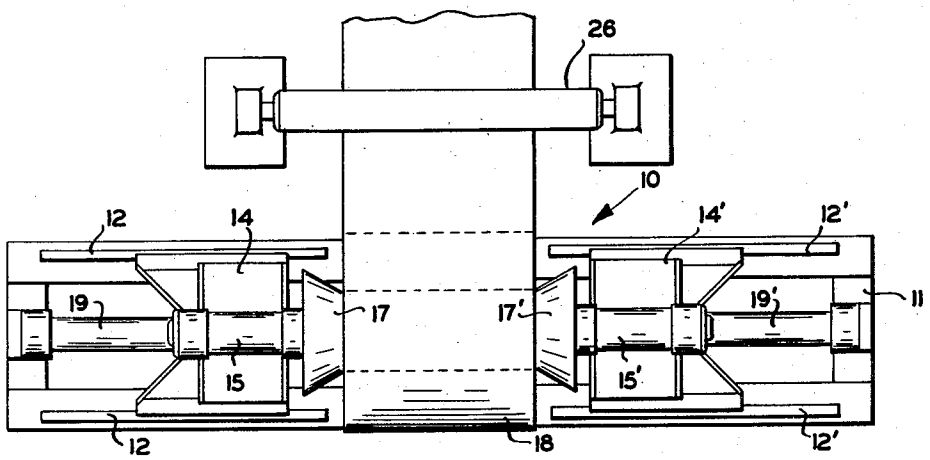

Fig 2

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UNCOILER WITH SIDE SHIFT CONTROL

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7 Claims. (Cl. 242—78.6)

This invention relates to apparatus for handling strip material and more particularly to improved apparatus for uncoiling strip prior to treating and processing thereof, for example.

It is an object of the present invention to provide improved uncoiling apparatus embodying a pair of relatively movable coil supporting heads and novel actuating means therefor whereby coils of material may be placed in an operative position for uncoiling and subsequent treating and/or processing in a minimum of time and with utmost facility.

Another object of this invention is the provision in apparatus of this character of a novel means of controlling the movement of the relatively movable coil supporting heads whereby upon a coil being rotatably supported by the heads the same may be synchronously shifted longitudinally of the axis of the coil in order to properly center the material with respect to treating or processing apparatus which may be associated with the uncoiling device. As will become apparent upon consideration of the description to follow, our novel control means may be advantageously used to provide longitudinal adjustment of a coil during the uncoiling thereof to compensate for any tendency of the material to shift to one side or the other of a predetermined pass line as may be caused by camber in the strip, for example.

More particularly the invention provides a fluid control circuit for an uncoiling device as above mentioned whereby each of the relatively movable heads of the apparatus may be moved inwardly and outwardly of the pass line in a manner independent of the movement of the cooperating head, but upon a coil being supported in the device actuation of either of the heads in a direction toward the other will cause both to shift while at the same time maintaining clamping pressure upon the coil

Yet another object of the invention is the provision of a fluid control circuit having the characteristics enumerated above which is of relatively simplified design whereby the control system may be economically utilized in connection with standard uncoiling apparatus, and is readily adaptable for installation on existing uncoiler units of the type having longitudinally adjustable coil supporting heads.

Various other objects and advantages of this invention will become apparent to one skilled in the art to which it pertains upon full consideration of the following detailed specification and accompanying drawing wherein is disclosed a certain preferred embodiment of the invention.

In the drawing:

Figure 1 is a fragmentary axial section of an uncoiling device constructed in accordance with the principles of our invention;

Figure 2 is a top plan view of the apparatus of Figure 1, there being omitted from the figure certain conventional coil rotating and braking elements illustrated in Figure 1; and

Figure 3 is a schematic showing of a hydraulic control circuit which may be utilized to control the apparatus of Figure 1 in the manner proposed by our invention.

Referring now to the drawing, and to Figure 1 thereof in particular, the reference numeral **10** designates a base member which, in the illustrated embodiment, comprises a plurality of I-beam members **11**. Secured to the upper surface of the base member **10** and extending inwardly from each longitudinal end thereof are spaced parallel guideways **12** and **12'** upon which are mounted coil supporting heads **13** and **13'**.

Each of the supporting heads **13** and **13'** is substantially the same and therefore but one will be described herein, with reference being made to corresponding parts of the other through the use of primed numerals.

Mounted directly upon the guideways **12** for to and fro sliding movement therealong is a supporting stand **14**. Secured to the upper portion of the stand, or forming an integral part thereof, is a cylindrical housing **15** which is adapted to receive a shaft **16**. The shaft **16** is rotatably supported by means of anti-friction bearings **44** and **45** and is directed parallel to the guideways **12** as shown. Rigidly secured to an inwardly extending end portion of the shaft **16** is a coil supporting mandrel **17** which is preferably of a conical or frusto-conical shape in order to facilitate entry into the center opening of a conventional coil of strip or sheet material **18**.

In the illustrated embodiment, longitudinal movement of the supporting head **13** is effected by means of a conventional hydraulic cylinder **19**, the body member of which is secured to the base member **10**, and the piston member of which is secured to the stand **14**. As will be apparent the application of fluid pressure to the cylinder **19** will cause the stand **14** to be moved inwardly or outwardly of the pass line of the material as may be desired.

In accordance with usual practice in this art we have provided a vertically movable coil cradle **20** located centrally of the base **10** and is normally retracted to a relatively low level to facilitate the positioning of the coil **18** thereon. In this embodiment the cradle **20** may be raised by means of a hydraulic cylinder **21** in order to position the axis of the coil **18** in substantial alignment with that of the shafts **16** and **16'** whereby the mandrels **17** and **17'** may be inserted into the center opening of the coil.

Also in accordance with usual practice we may provide means comprising motor **22**, gear reducer **23**, and gears **24** and **25** (shown here mounted upon the stand **14**) to slowly rotate the shaft **16** and hence the coil **18** to initially thread the material into rolls **26** of an associated processing device. Upon the stand **14'** we have provided suitable braking means comprising wheel **27** and brake band **28** whereby tension may be applied to the material leaving the coil **18** as is often desirable.

It may be understood that by application of suitable fluid pressure to the outer ends of the cylinders **19** and **19'**, a coil **18** may be securely held by the mandrels **17** and **17'**. It will be further understood, however, that even provided that the supporting heads **13** and **13'** move inwardly in a synchronous manner, various defects in the shape of the coil **18**, as for example out-of-roundness of the center opening or axial displacement of the convolutions of the coil, may cause the material to be off center with respect to the desired pass line. Thus it is highly desirable to provide means of longitudinally adjusting the position of the coil **18** after the same has been clamped by the mandrels **17** and **17'** so that the material may be properly threaded into the machine. And in case of a coil defect such as the latter it is desirable to have a means of quickly and accurately adjusting the position of the coil as the material pays off so that any of the outer

convolutions which may have shifted axially with respect to the innermost convolution may be fed into the rolls 26 in proper alignment. Also, compensation may be effected for camber in the strip which tends to cause the strip to creep laterally. We provide for such adjustment by means of the hydraulic circuit shown in Figure 3. In this illustration we provide conventional four-way valves 29 and 29' which communicate with a source of fluid by means of conduits 30 and 30', and with the forward ends of cylinders 19 and 19' through conduits 31 and 31'. Connecting the outer end of cylinder 19 with the valve 29 we provide conduit 32, a three-way valve 33 and conduit 34; a similar arrangement being, of course utilized to connect the cylinder 19' and four-way valve 29'. In accordance with the invention we connect the valves 33 and 33' with conduits 31 and 31' respectively by means of conduits 35 and 35' and check valves 36 and 36'. An exhaust conduit 37 or 37' is connected to each of the conduits 35 and 35' intermediate the check valves and the three-way valves 33 and 33'.

Valve 33, as valve 33', is normally retained in one of its two operative positions by means of a spring 38 which acts upon one end of the valve plunger 39. With the plunger 39 in the position shown, conduit 32 communicates with conduit 34 and hence with the outer end of cylinder 19. Thus the piston member of the cylinder 19 may be actuated in either the forward or reverse direction by the proper setting of the four-way valve 29 as will be understood.

To shift the plunger 39 to the other of its operative positions we provide an operator 40 which is adapted in response to the application of a predetermined pressure thereto to move the plunger against the action of the spring 38, or inwardly as viewed in Figure 3. As provided by the present invention the plunger 39, when in the second-mentioned or inner position is operative to connect conduit 34 with the exhaust conduit 37 and with conduit 35 through the check valve 36. Conduit 32 is of course isolated from the circuit with the plunger 39 in the inner position.

Pressure for actuating the operator 40 is obtained through a conduit 41 which communicates with the outer end of the operator 40 and with the outer end of the oppositely disposed cylinder 19'. Thus it may be observed that upon the attainment of a certain predetermined pressure at the outer end of the cylinder 19' the plunger 39 will be caused to shift inwardly removing the pressure from the outer end of the cylinder 19 and permitting the fluid therein to circulate through conduit 34, valve 33, check valve 36 and conduit 35 to the forward end of the cylinder 19 with a conventional pressure relief valve, not shown, inserted between the conduit 37 and the source of hydraulic fluid.

As shown, an identical arrangement is provided for controlling the fluid pressure applied to the cylinder 19'.

In the operation of the uncoiling apparatus a coil 18 is positioned on the cradle 20 as shown in Figure 1. The cradle may then be caused to raise by means of a four-way valve 42 which is in communication with a source of fluid through conduit 43. After raising the coil 18 to the proper height the valves 29 and 29' may be operated to apply pressure to the outer ends of cylinders 19 and 19' whereby the mandrels 17 and 17' are moved inwardly into the center opening of the coil.

With the coil 18 thus supported upon the mandrels the cradle 20 is lowered to its normal retracted position. Should it then be found necessary to center the coil with respect to the rolls by, for example, shifting the coil toward the left, the operator merely manipulates the valve 29' to apply pressure to the outer end of cylinder 19'. The piston member of cylinder 19 will of course be locked firmly in position due to the fluid which is trapped at each of its ends. Thus fluid pressure will build up in the cylinder 19' until such time as it becomes sufficient to actuate the operator 40 to shift the plunger 39 inwardly. With the plunger 39 in its inner position a circuit is formed which connects the outer and inner ends of the cylinder 19 whereby the piston member thereof is released and moved to the left due to the force exerted upon the piston of cylinder 19'.

It will be apparent that as the piston member of cylinder 19 is moved to the left fluid will be forced out of its outer end and drawn into its inner end through the conduit 35. Due to the displacement of the piston rod, however, there will be a greater volume of fluid displaced from the outer end of the cylinder than will be drawn into the inner end. To discharge the excess we have provided the exhaust conduit which is connected into the conduit 35 between the valve 33 and the check valve 36. The check valve is of course necessary to prevent discharge of fluid from the forward end of the cylinder.

In order that the circuit connecting the inner and outer ends of cylinder 19 be maintained it is of course requisite that sufficient pressure exist in the conduit 34'. It should therefore be understood that the plunger 39 will inherently be positioned so as to permit fluid to flow through the conduit 34 only to such extent as will create a certain back pressure within the outer end of cylinder 19. This pressure will determine the clamping force exerted upon the coil 18 and will be dependent upon the characteristics of the valve 33.

To shift the coil 18 in a direction toward the right the valve 29 is manipulated to move the supporting head 13 inwardly. By the same arrangement as above described the opposite supporting head 13' will move to the right against a certain back pressure by means of which the coil is maintained securely clamped between the mandrels 17 and 17'.

The coil may of course be released at any time by causing either or both of the supporting heads 13 or 13' to move outwardly.

It should now be apparent that we have accomplished the objects initially set forth. We have provided a novel arrangement for uncoiling strip material which is particularly adapted to facilitate the positioning of a coil in operative relation to apparatus which may be associated with operations of this nature. The arrangement as hereinbefore set forth provides means of simultaneously shifting the coil supporting mandrels of conventional uncoiling apparatus whereby the same may be substantially instantaneously adjusted to properly center a coil with respect to a desired pass line without affecting the normal clamping pressure upon the coil.

It will be noted that while the coil supporting heads are normally independently movable, the arrangement of our invention, while providing for simultaneous movement for adjusting the coil position, does not require such means for simultaneous movement to be independent of the means for moving the heads individually. Rather we eliminate this heretofore necessary expediency by providing a hydraulic circuit comprising a novel combination of conventional elements whereby a coil will remain under a predetermined clamping pressure even during movement of the supporting heads.

It will further be noted that the system proposed by the present invention is readily adaptable for use on many uncoilers presently installed and in operation. It has of course been common in such uncoiling apparatus to utilize independently movable coil supporting heads to facilitate loading of the coiled material. It should thus be apparent that the adaptation of the control system of our invention to such existing apparatus would be well within the scope of one skilled in the art.

Having thus described a preferred embodiment of our invention, what we claim is new and desire to secure by Letters Patent is:

1. In uncoiling apparatus having a base and a pair of oppositely disposed coil supporting heads slidable on said base; hydraulic systems for moving each of said supporting heads, each of said systems comprising a hydraulic

cylinder operatively connected to said base and one of said supporting heads and adapted to move the same inwardly and outwardly along said base, a source of fluid, a four-way valve communicating with said source of fluid, a first conduit connecting said four-way valve and the inner end of the cylinder of one of said systems, a second conduit connected at one end to the outer end of the last mentioned cylinder, a pressure responsive valve connected to the other end of said second conduit, a third conduit connecting said pressure responsive valve and said four-way valve, said pressure responsive valve being normally operative to connect said second and third conduits and alternatively operative to connect said second conduit with an exhaust port, and a fourth conduit connecting said pressure responsive valve with the outer end of the cylinder of the other of said systems, said pressure responsive valve being operative in response to predetermined pressure in said fourth conduit to shift to its alternatively operative position.

2. Apparatus according to claim 1 further characterized by said pressure responsive valve having a valve plunger adapted to normally connect said second and third conduits and alternately operative to close said third conduit and connect said second conduit with said exhaust port, yieldable means adapted to urge said plunger into its normal position, an operator adapted upon the application of a predetermined pressure thereto to move said plunger against the action of said yieldable means into said alternative position; and said fourth conduit connecting the outer end of the cylinder of the other of said systems and communicating with said operator whereby the pressure in the outer end of the last named cylinder is transmitted to said operator.

3. Apparatus according to claim 2 further characterized by a fifth conduit connecting said exhaust port and the inner end of the said cylinder of one of said systems, a check valve interposed in said fifth conduit permitting unidirectional flow of fluid therein from said port to said cylinder, and an exhaust conduit communicating with said fifth conduit between said check valve and said port.

4. In uncoiling apparatus having a base and a pair of oppositely disposed coil supporting heads slidable on said base; hydraulic systems for moving each of said supporting heads, each of said systems comprising a hydraulic cylinder operatively connected to said base and one of said supporting heads and adapted to move the same inwardly and outwardly along said base, first and second conduits connecting the inner and outer ends of the cylinder of one of said systems, a four-way valve communicating with said conduits, a source of fluid connecting said four-way valve, the arrangement being such that fluid under pressure may be supplied to either end of the last mentioned cylinder while exhausting the other end, a pressure responsive valve having a port communicating with the outer end of the last mentioned cylinder and an exhaust port, a control conduit connecting said pressure responsive valve and the outer end of the cylinder of the other of said systems, said valve being operative in response to a predetermined pressure attained in the outer end of the cylinder of said other system and transmitted to said valve through said control conduit to connect the said ports of said pressure responsive valve.

5. Apparatus according to claim 4 further characterized by a third conduit connecting said exhaust port and the inner end of the said cylinder of one of said systems, a check valve interposed in said conduit permitting unidirectional flow of fluid from said exhaust port to said cylinder, and an exhaust conduit communicating with said third conduit intermediate said check valve and said pressure responsive valve.

6. In uncoiling apparatus having a base and a pair of oppositely disposed coil supporting heads slidable on said base; hydraulic systems for moving each of said supporting heads, each of said systems comprising a hydraulic cylinder operatively connected to said base and one of said supporting heads and adapted to move the same inwardly and outwardly along said base, first and second conduits connecting the outer and inner ends respectively of the cylinder of one of said systems, a four-way valve communicating with said conduits, a source of fluid communicating with said four-way valve, the arrangement being such that fluid under pressure may be supplied to either end of the last mentioned cylinder while exhausting the other end, means communicating with the outer end of the last mentioned cylinder and including a valve responsive to the attainment of a predetermined pressure in the outer end of the cylinder of the other of said systems to permit the exhaust of fluid from the outer end of said first mentioned cylinder.

7. In apparatus for uncoiling metal strip and having a base and a pair of oppositely disposed coil supporting heads slidably mounted on said base for inward and outward movement toward and away from each other; the improvement which comprises separate hydraulic cylinders for moving each of said heads independently of the other whereby the individual positions of the heads may be determined as well as the spacing between them, separate hydraulic circuits connecting said separate cylinders, said separate circuits including separate control valves, separate pressure responsive valves connecting each of said cylinders and providing for outward movement of said cylinders and heads independently of said control valves, and a single source of hydraulic fluid under pressure for energizing said hydraulic circuits.

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