

Oct. 20, 1959

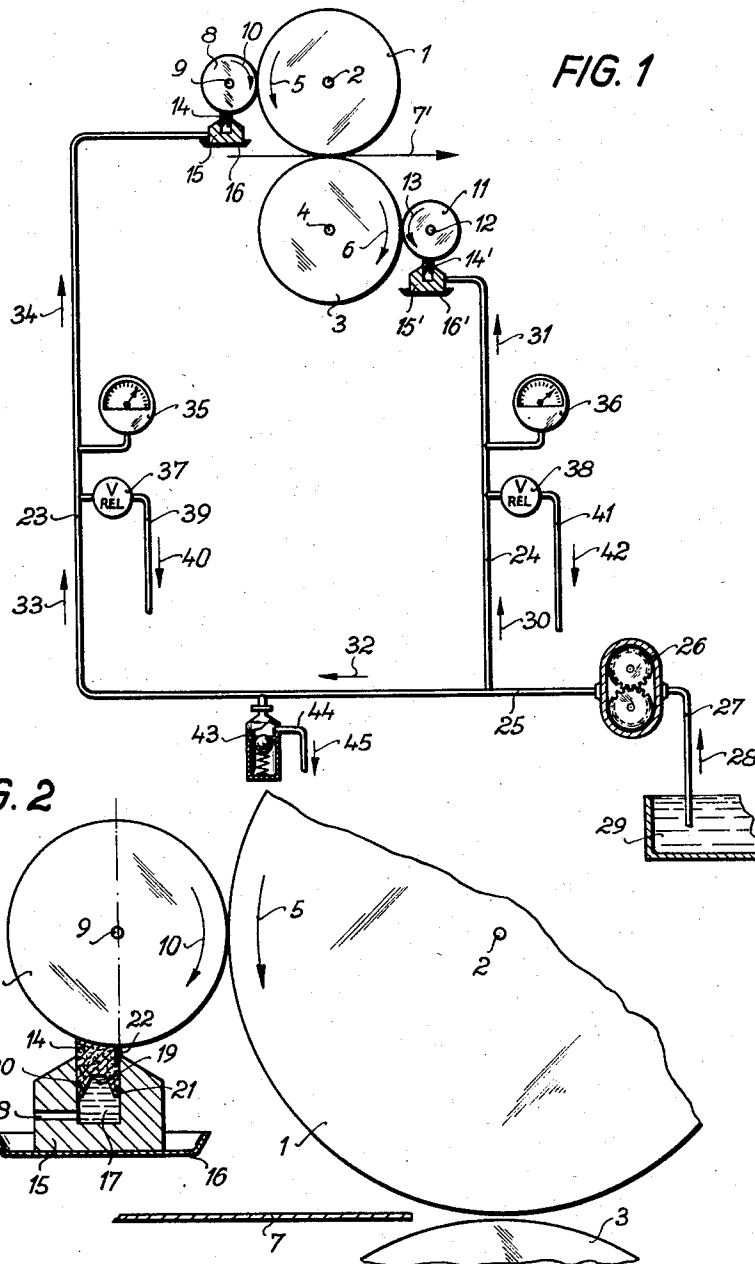
F. UNGERER

2,909,150

MACHINE FOR LUBRICATING METALLIC SHEETS

Filed Jan. 16, 1957

2 Sheets-Sheet 1



INVENTOR

FRITZ UNGERER

BY Leon M. Strauss AGT.

Oct. 20, 1959

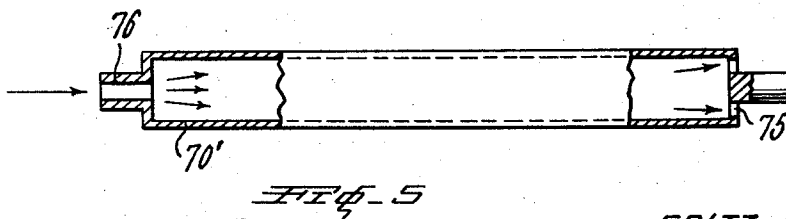
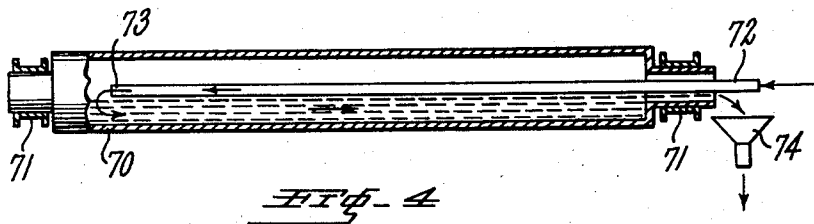
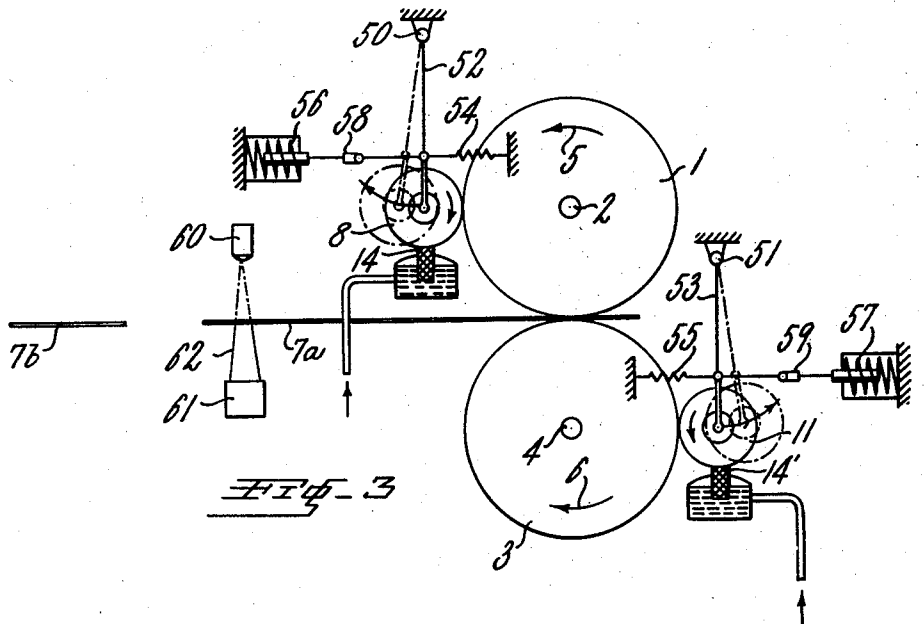
F. UNGERER

2,909,150

MACHINE FOR LUBRICATING METALLIC SHEETS

Filed Jan. 16, 1957

2 Sheets-Sheet 2



INVENTOR.
FRITZ UNGERER
BY *Leon H. Strauss*
att.

1

2,909,150

MACHINE FOR LUBRICATING METALLIC SHEETS

Fritz Ungerer, Phorzheim-Brotzingen, Germany

Application January 16, 1957, Serial No. 634,579

8 Claims. (Cl. 118—227)

The present invention relates to a machine for lubricating metallic sheets.

It is a general practice to lubricate or to provide an oil film on sheets or strips of steel in finished condition prior to their shipping from the mill to a manufacturer in order to ensure that they do not rust. The oil film on such sheets or strips must generally be as thin as possible.

Known machines for oiling sheet metal are usually provided with two rollers between which the sheet is moved upon its feed into the machine, these rollers serving at the same time both as feed or transporting rollers and as oil applying rollers. To this end oil is supplied to these rollers in the form of drops, the quantity of oil being regulated through adjustment of small valves. A second pair of rollers is located behind the first pair as viewed in the direction of movement of the sheet. The rollers of the second pair function as doctors or film-forming means. Their upper surfaces consist generally of oil-resistant synthetic rubber. The rollers of the second pair remove the superfluous amount of the oil applied to the sheet from the surface of the latter. Depending on whether the doctor rollers engage the sheet with a greater or lesser pressure, the oil film is rendered thicker or thinner, but its thickness has been found to vary considerably even with a constant adjustment of the roller pressure.

The known machines of this type can be employed only with a sheet movement speed of approximately 15 to 20 mm. per minute. In sheet splitting or dividing plants, however, speeds as high as 200 meters and more per minute are attained. At such speeds it becomes noticeable that the pressing and film-forming rollers of known oiling machines cannot remove the superfluous oil to a sufficient extent.

The wedge-shaped mass of oil which is thus formed between the metallic sheet and the rollers cannot be pushed aside rapidly enough at such speeds of sheet movement and on the contrary it lifts the rollers from the sheet surface or flattens their rubber coated upper surfaces so that there remains on the moving metallic sheet an oil film which is much thicker than desired. This defect cannot be eliminated by increasing the pressure of the doctor rollers against each other since this can under any circumstances be raised only to a limited extent. Should too high a pressure be exerted the synthetic rubber coatings of the doctor rollers are kneaded and greatly deformed and due to the resultant heating thereof tend to be damaged and rendered useless within relatively short periods of time.

The principal object of the present invention is to provide means countering the above mentioned and other drawbacks and affording the construction of a machine facilitating sheet lubrication and formation of a very thin oil film at extremely high speeds of sheet movement, the oil film preferably being not thicker than about 0.004 mm.

A further aspect of the invention is that a single pair of rollers, between which the sheet of metal is to move,

2

is employed for applying the desired oil film without the use of any subsequent doctoring or spreading means, such as are exemplified by the doctoring or spreading rollers of the prior art, the present invention thus entailing use of finishing oiling rollers as the only sheet transporting rollers in the machine.

Inasmuch as these oiling-transporting rollers have applied thereto only a quantity of oil sufficient to ensure the desired degree of lubrication, spreading or doctoring means may be dispensed with. Moreover, it is no longer necessary to press the rollers against the sheets with great force whereby their upper and sheet contacting surfaces are protected against wear and tear.

Tests have shown that by means of a machine constructed in accordance with the principles of the present invention films of oil of utmost thinness can be formed on the sheet, which films can hardly be noticed even by pressing a blotting paper or cigarette paper of the finest texture against the sheet surface. Advantageously, the oil-applying rollers have their outermost surfaces made of oil resistant rubber or synthetic rubber materials.

For the purpose of feeding the correct quantity of oil to oiling rollers, the invention further contemplates the use of special oil-supplying rollers preferably made of steel, the finishing oiling rollers and the oil-supplying rollers being so positioned relative to one another that they abut yieldably against one another, preferably with an adjustable pressure.

Delivery of oil to the oil supplying rollers, from which it is to be transferred to the oiling rollers, takes place in accordance with the invention through the intermediary of oil-feeding strips made of porous material, such as felt, lying against the supplying rollers, means being provided for adjusting the pressure with which the strips abut against said supplying rollers. The fibres, of which the felt for use as oil-feeding strips consists, are advantageously especially resistant to abrasion and wear, a characteristic which is especially pronounced in commercially available nylon.

Further characteristics of the invention relating inter alia to the construction of the oil-feeding strips, to their arrangement with respect to the oil supplying rollers, to the adjustability of the contact pressure between such strips and rollers, to the interruption of the operation of the finishing oiling rollers and to the cooling of the latter and/or the respective oil supplying rollers will be more fully determined from the following description of a preferred embodiment of the invention, when considered in conjunction with the attached claims and the drawing.

In the drawings:

Fig. 1 is a schematic illustration of an oiling machine and the elements thereof constructed in accordance with the principles of the present invention and

Fig. 2 is a partly sectional view, on an enlarged scale, of a portion of the machine shown in Fig. 1.

Fig. 3 illustrates schematically the feeding of sheet metals past a photo cell and light source arrangement and solenoid means controlled by the latter for moving the oil supply rollers towards and away from the oiling rollers;

Fig. 4 shows in section a hollow oil supply roller which is liquid-cooled; and

Fig. 5 shows partly in section an oil supply roller for the admission and cooling by means of air.

Referring now more particularly to the drawings, the machine according to the present invention includes an oiling roller 1 having an outer surface made in a known manner of oil-resistant natural or synthetic rubber and journaled for rotation about an axis 2. Disposed opposite to the roller 1 is a similar finishing oiling roller 3 journaled for rotation about an axis 4. The roller 1 rotates in the direction of arrow 5, and the roller 3 rotates

3

in the direction of arrow 6. The metallic sheet 7 is fed between the two finishing oiling rollers 1 and 3 in the direction of arrow 7'. Positioned adjacent the oiling roller 1 is an oil-supplying roller 8 journaled for rotation about an axis 9 in the direction of arrow 10, this roller preferably being made of steel and having its peripheral surface in contact with the outer surface of the oiling roller 1. In a corresponding manner an oil-supplying roller 11 located adjacent the finishing oiling roller 3 is journaled for rotation about an axis 12 in the direction of arrow 13 and has its outer surface in contact with the outer surface of roller 3.

The bearings for the various rollers are so arranged that the oiling rollers abut against the supplying rollers with a yieldable, preferably adjustable pressure. To this end, either the axles of the oiling rollers and/or the axles of the supplying rollers may be movably supported. Generally it will be found simplest to arrange the supplying rollers 8 and 11 for relative transverse movement with respect to the oiling rollers 1 and 3.

Oil is fed to the supplying rollers 8 and 11 by means of oil-feeding strips 14 and 14' made of a suitable porous material. These strips have forward and rearward ends and are slidably guided and supported in holding means 15 and 15' beneath which are arranged pans or troughs 16 and 16' for catching excess oil.

In the illustrated embodiment of the invention the holding means are constructed in the form of ledges provided with grooves opening upwardly and having mounted therein the oil-feeding strips 14 and 14', the lower portions of these grooves forming oil chambers 17 (Fig. 2). These chambers communicate with conduits 23 and 24 through channels 18 provided in the holding means 15 and 15'. Each oil-feeding strip is provided on its rearward end or side facing the oil chamber 17 with a recess 19 to thereby form lateral sealing lips 20 and 21.

The oil-feeding strips are so arranged with respect to the associated oil-supplying rollers 8 and 11 that a plane extending along the lateral surface of each feeding strip facing in a direction opposite to the direction of rotation of the respective oil-supplying roller also extends through the axis of rotation of said respective oil-supplying roller. Each feeding strip 14 or 14' has that edge of the aforesaid side or forward end contacting the respective oil supplying roller packed or strengthened, as shown at 22, preferably through impregnation with an elastically hardening medium, such as an oil-resistant resin or synthetic resin.

As will be seen from Fig. 1, the conduit 23 is connected to the oil chamber of the holding means 15, while the conduit 24 is connected to the oil chamber of the holding means 15'. These conduits branch off from a feed or supply pipe 25 to which oil is fed by any suitable means 26, which may, for example, be a gear pump. Such a pump draws the oil through a pipe 27 in the direction of arrow 28 from a reservoir 29.

Under the pressure of the pump the oil flows through the conduit 24 to the holding means 15' in the direction of arrows 30, 31 and through the conduit 23 to the holding means 15 in the direction of arrows 32, 33 and 34. Pressure gauges 35 and 36 are connected, respectively, to the conduits 23 and 24.

The branch conduits 23 and 24 are controlled, respectively, by finely adjustable overflow-regulating valves 37 and 38, although it will be readily realized that in lieu of two such valves a single overflow-regulating valve may be provided for controlling both conduits jointly. Correspondingly, the pressure gauges 35 and 36 could then be replaced by a single pressure gauge.

Oil overflowing through the valve 37 is returned through a pipe 39 (only schematically indicated) in the direction of arrow 40 to the reservoir 29, and in a corresponding manner oil overflowing through the valve 38 is directed through a pipe 41 in the direction of arrow 42 back to the reservoir 29 (only schematically shown).

4

As may be seen from Fig. 1, the oil pressure system has connected thereto a maximum pressure-limiting valve 43 which may, by way of example, have the form of a spring press ball valve. Oil flowing through the valve 43 enters a pipe 44 and is returned in the direction of the arrow 45 to the reservoir 29.

Since at least one oiling roller is arranged above and below the path of travel of the metallic sheet 7, the latter upon passage between these rollers is provided with a finishing oil film, thus completely oiled or lubricated.

The oil-feeding strips 14 and 14' are essentially maintained perpendicular to the plane of the sheet 7. The pressure of the fluid in the chambers 17 forces the sealing lips 20 and 21 formed on each strip lightly against the walls of the respective groove defining the associated oil chamber, thus ensuring a good sealing action therefor. The strips 14 and 14' are further pressed against the supplying rollers 8 and 11 due to the pressure conditions existing in the chambers 17, so that the contact between each strip and associated supplying roller is uniform throughout, thus resulting in a uniform and even feeding of oil film to each supplying roller over the entire surface area thereof.

Due to the packing or hardening of the strips 14 and 14' at 22 any oil which was not removed from the supplying rollers 8 and 11 by the oiling rollers 1 and 3 is stripped from the supplying rollers. This excess oil then flows over the slanted upper surfaces of the holding means 15 and 15' into the pans or troughs 16 and 16', respectively, and from the latter back to the reservoir 29. Moreover, by virtue of the provision of the strengthened edge areas 22, abrasion and wear of the oil-feeding strips pressed against the oil-supplying rollers is substantially reduced to a minimum.

The thickness of the oil films formed on the metallic sheet 7 depends, of course, on the adjustment of the overflow valves 37 and 38 which determines the pressure in the chambers 17, the gauges 35 and 36 enabling the magnitude of this pressure to be easily determined.

When a machine constructed in accordance with the invention is incorporated in a continuously operating system, for example, a cutting mechanism for steel sheet strips, it may happen that for some reason while the machine is running no sheet of metal is transported thereto for a shorter or longer interval of time. In such a case the oil film on the oiling rollers would tend to become somewhat thicker than it would during any interval in which oil would be regularly deposited on a moving sheet of metal, as a result of which the first of any batch of sheets thereafter fed through the machine would become covered with a somewhat thicker oil film which in some cases may not be desirable.

In order to avoid this defect, the invention may be further refined by the support of the supplying and oiling rollers relative to one another in such a manner that they may be separated from one another, preferably by moving the oil supplying rollers out of surface engagement with the oiling or oil finishing rollers. For details see Fig. 3 in which oil supply rollers are movable away from oiling rollers by means of solenoid.

To this end means may be provided which control this separation of the supplying rollers from the oiling rollers automatically and in such a manner that upon entry of a sheet of metal into the region between the oiling rollers the oil supplying rollers engage said oiling rollers while after the sheet has passed the oiling rollers the supplying rollers are automatically lifted or separated from the oiling rollers. Such means may be mechanical in nature, for example, in the form of feeler or sensing levers, or electro-mechanical, for example, in the form of a magnetic sensing and operating mechanism. Alternatively, mechanical-hydraulic, mechanical-pneumatic, electro-hydraulic, electro-pneumatic or electro-optical means may be employed for this purpose.

In the example illustrated in Fig. 3, the elements of

5

the structure described above are shown and are designated by the same reference characters. Thus, Fig. 3 shows the transporting rollers 1 and 3 as well as the oil supply rollers 8 and 11 which respectively supply oil to the combination transporting and oiling rollers 1 and 3, the structure for supplying oil to the oil supply rollers 8 and 11 being identical with that shown in Fig. 1.

As will be seen from Fig. 3, the oil supply rollers 8 and 11 are supported from suitable stationary pivots 50 and 51, respectively, the pivots being connected to the rollers 8 and 11 by any suitable levers 52 and 53, respectively, or the like. Springs 54 and 55 are respectively connected to the levers 52 and 53 and act through the latter on the rollers 8 and 11 for urging the latter to the operative positions, respectively, in engagement with the rollers 1 and 3. Solenoids 56 and 57 are respectively connected through suitable linkages 58 and 59 to the levers 52 and 53, respectively, and when these solenoids are energized they will turn the levers 52 and 53, respectively, against the force of the springs 54 and 55 to disengage the rollers 8 and 11 from the rollers 1 and 3, respectively. When the solenoids are deenergized, the springs 54 and 55 act to return the rollers 8 and 11 to their operative positions, respectively.

In the example illustrated in Fig. 3, a photo-electric cell 60 cooperates with a light source 61 for automatically controlling the solenoids 56 and 57. As is shown diagrammatically in Fig. 3, the beam of light 62 from the light source 61 travels across the path of movement of the sheet metal. The sheet 7a is shown in Fig. 3 interrupting the light beam 62, so that it cannot reach the photo-electric cell 60 to which the light beam would travel, as shown in dotted lines, if the sheet 7a were not present.

This photo-electric cell 60 is connected electrically with the solenoids 56 and 57 in a suitable electrical circuit in such a way that as long as light from the light source 61 does not reach the photo-electric cell 60, the solenoids remain deenergized and the springs 54 and 55 maintain the rollers 8 and 11 in engagement with the rollers 1 and 3, respectively.

Sheet 7a is shown in Fig. 3 spaced from the succeeding sheet 7b by a relatively small interval only for the sake of convenience. As soon as the sheet 7a has advanced sufficiently to the right, as viewed in Fig. 3, to move beyond the light beam 62, the latter reaches the photo-electric cell 60 to energize the latter and close the circuit to the solenoids 56 and 57, so that the latter become energized and move the rollers 8 and 11 from the solid to the dotted line positions shown in Fig. 3, respectively, and in these dotted line or inoperative positions the rollers 8 and 11 are respectively disengaged from the rollers 1 and 3. The photo-electric cell 60 is so positioned that when the sheet 7a moves beyond the beam 62, there is sufficient oil on the rollers 1 and 3 to provide the desired oil film on the remainder of the sheet 7a which is still to move between the rollers 1 and 3.

As soon as the light beam 62 reaches the photo-electric cell 60, the rollers 8 and 11 are maintained in a disengaged position away from the rollers 1 and 3, so that too much oil does not accumulate on the latter.

When the next sheet 7b advances sufficiently to interrupt the light beam 62, the solenoids 56 and 57 are deenergized and the springs 54 and 55 return the rollers 8 and 11 to their solid line position shown in Fig. 3. By the time the sheet 7b reaches the rollers 1 and 3, the latter have had applied thereto sufficient oil to provide the desired film on the sheet 7b from the leading end thereof.

In order to avoid, during a relatively long period of uninterrupted operation, at high contact pressure of the oil-feeding strips 14 and 14' and high rotational speed of the feeding rollers 8 and 11, generation of an excessive amount of heat, a cooling system for the oiling rollers and, if desired, also for the oil-supplying rollers may be provided. This may consist of an air-blowing system or alternatively of a system for traversing a cooling liquid, 75

6

such as water, through the rollers the interior thereof may be provided with pipes. Overheating can furthermore be prevented by cooling the oil through the intermediary of any conventional oil cooler prior to the time, at which such oil is fed to the supplying and oiling rollers (see Figs. 4 and 5).

Fig. 4 shows an oil supply roller 70 which can be used for either or both of the rollers 8 and 11. The hollow roller 70 is supported for rotation by the stationary bearings 71, and the journals of the roller 70 which passes through the bearings are tubular and communicate with the interior of the hollow roller 70, so that a liquid supply pipe 72 supplied with a liquid such as water or the like by any suitable pump from any suitable source, for example, may extend through one of the hollow journals into the interior of the hollow roller 70. It will be noted that the free open end 73 of the pipe 72 is located adjacent a roller journal opposite to that through which the pipe 72 passes, so that the cooling liquid entering into the roller through the pipe 72 must travel almost along the entire length of the roller before the liquid can discharge from the end 73 of the pipe 72. The left journal of the roller 70 shown in Fig. 4 is preferably closed. In this way the liquid leaving the pipe 72 is compelled to flow back along the roller 70 and out through the hollow journal through which the pipe 72 extends, a suitable funnel and conduit means or the like, 74, being provided for catching the liquid and directing it to any desired location. Since the roller 70 rotates while it is in its operative position supplying oil to an oiling roller, all of the material of the roller 70 continuously passes beneath the body of the cooling liquid in the roller 70, and thus the latter is sufficiently cooled.

In Fig. 5 the oil supply roller 70' is shown which may be identical with that of Fig. 4, except that the left journal of this roller is hollow, while the right journal is solid or closed, and the right end wall of the roller 70' is formed with openings 75 through which a cooling gas such as air may discharge to the outer atmosphere. The air is introduced into the interior of the roller 70' through the hollow journal 76 thereof which is tubular, which has opposite open ends and which communicates with the interior of the hollow roller 70'. Air is introduced into the hollow journal 76 by any suitable means receiving air under pressure and directing this air in the form of a jet through the hollow journal 76 into the interior of the hollow roller 70', so that in this way the oil supply roller may be cooled by a gas, if desired.

Where the embodiment of Fig. 4 is used with an arrangement as shown in Fig. 3, the pipe 72 shown in Fig. 4 is supported for movement together with the roller 70 when the latter moves between its operative and inoperative positions, so that there is no relative movement between the pipe 72 of Fig. 4 and the roller 70.

Of course, the above-described rollers 8 and 11 rotate only as a result of engagement with the driven rollers 1 and 3, respectively.

It can thus be seen that there has been provided a machine for lubricating the surfaces of a metal sheet by means of a pair of feeding rollers arranged in superposed relation to each other; comprising first means continuously supplying lubricant to one of said rollers, second means arranged adjacent the other roller and supplying lubricant thereto in sufficient quantity, so that, when said sheet has been fed beyond said pair of rollers, it is uniformly covered at both surfaces thereof with a relatively thin, uniformly distributed film of lubricant, said first means including a first steel roll located ahead of and in contact with said one roller, said second means including a second steel roll positioned rearwardly of and in contact with said second roller, lubricant-feeding strips terminating in lateral edges and in contact with said steel rolls, whereby said lateral edges of said strips face in a direction opposite to the direction of rotation of said steel rolls

7

and are located below and aligned with the axes of rotation of said steel rolls.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. A machine for oiling sheets comprising a pair of finishing oiling rollers for oiling and transporting said sheets, oil supplying rollers engaging said finishing rollers for transferring a continuous, thin, uniform coat of oil on said finishing rollers, oil feeding strips terminating in forward ends engaging said oil supplying rollers under pressure, oil conduit means operatively connected to said strips, and means connected to said conduit means for regulating the oil pressure via said oil conduit means against said strips and thereby the pressure of engagement between said forward ends of said strips and said oil supplying rollers thereby to eliminate thick non-uniform coating of oil on said finishing oiling rollers and subsequently on sheets to be oiled.

2. A machine for oiling sheets comprising a pair of finishing oiling rollers for oiling and transporting said sheets, oil supplying rollers engaging said finishing oiling rollers, oil feeding strips terminating in rearward and forward ends, said forward ends engaging said oil supplying rollers under pressure, conduit means communicating with said strips for supplying oil under pressure to said strips, means connected to said conduit means for regulating the oil pressure against the rearward ends of said strips and thus the pressure of engagement between said forward ends of said strips and said oil supplying rollers, and holding means slidably supporting said oil feeding strips and in communication with said conduit means.

3. A machine for oiling sheets comprising a pair of finishing oiling rollers for oiling and transporting said sheets, oil supplying rollers engaging said finishing oiling rollers, oil feeding strips terminating in ends engaging said oil supplying rollers under pressure, conduit means in communication with said strips for supplying oil under pressure to said strips, means connected to said conduit means for regulating the oil pressure against said strip ends and thus the pressure of contact of said strip ends toward said oil supplying rollers to eliminate thick non-uniform coating of oil on said finishing oiling rollers and subsequently on said sheets to be oiled, and holding means

8

for slidably supporting said oil feeding strips, said holding means having chamber means containing oil with which said strips are in contact, said chamber means communicating with said conduit means.

4. In a machine according to claim 3, wherein said strips terminate in forward concave ends, said concave ends conforming to arcs of the outer surfaces of said oil supplying rollers when engaging said oil supplying rollers.

5. In a machine according to claim 3, wherein said strips have rearward ends provided with lips forming recesses in the rearward ends of said strips and facing said chamber means to thereby effect a lateral sealing of said strips against said holding means by said lips.

6. In a machine according to claim 3, wherein said holding means support said strips in an upright position essentially perpendicular to the plane of said sheets, said strips having forward ends with leading edges thereof coplanar with the axis of rotation of said oil supplying rollers, said leading edges being hardened by means of an oil resistant resinous material.

7. A machine according to claim 3, said holding means being provided with slanting top surfaces diverging downwardly from said strip ends, an overflow pan disposed beneath said holding means whereby excess oil from said ends of said oil feeding strips is directed on to said slanting surfaces and thence into said overflow pan.

8. A machine according to claim 3, including a pump connected to said conduit means for supplying oil under pressure to said oil feeding strips, said regulating means including valve assemblies connected to said pump for controlling the pressure of oil via said chamber means to said oil feeding strips.

References Cited in the file of this patent

UNITED STATES PATENTS

1,397,522	Jacobs	Nov. 22, 1921
1,634,258	Halpin	July 5, 1927
1,680,711	Weston et al.	Aug. 14, 1928
2,167,430	Booty et al.	July 25, 1939
2,241,554	Lang et al.	May 13, 1941
2,390,001	Schindler	Nov. 27, 1945
2,711,132	Viscardi	June 21, 1955

FOREIGN PATENTS

870,329	Germany	Mar. 12, 1953
---------	---------	---------------