United States Patent [19]

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[54] OILING ROLLER

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[52] **U.S. Cl.** **29/125,** 118/227

[51] **Int. Cl.** **B21b 31/08**

[58] **Field of Search** 29/125; 118/244, 227

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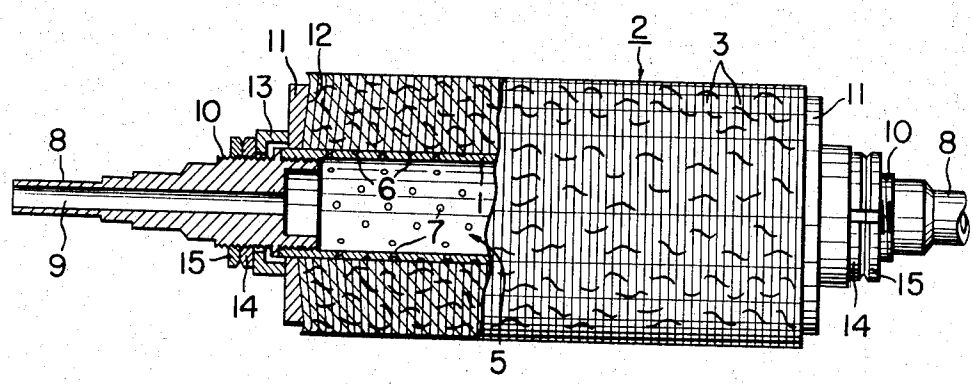
Primary Examiner—Alfred R. Guest

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[57] **ABSTRACT**

An oiling roller for oiling metal sheet. This oiling roller comprises a hollow arbor having a plurality of small holes penetrating the arbor wall on the circumference thereof, the elastic porous pad in a cylindrical form placed over the circumference of said hollow arbor, and means for pressing the circumferential portion of said cylindrical pad in the axial direction of the cylinder.

3 Claims, 8 Drawing Figures



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SHEET 1 OF 3

FIG. 1

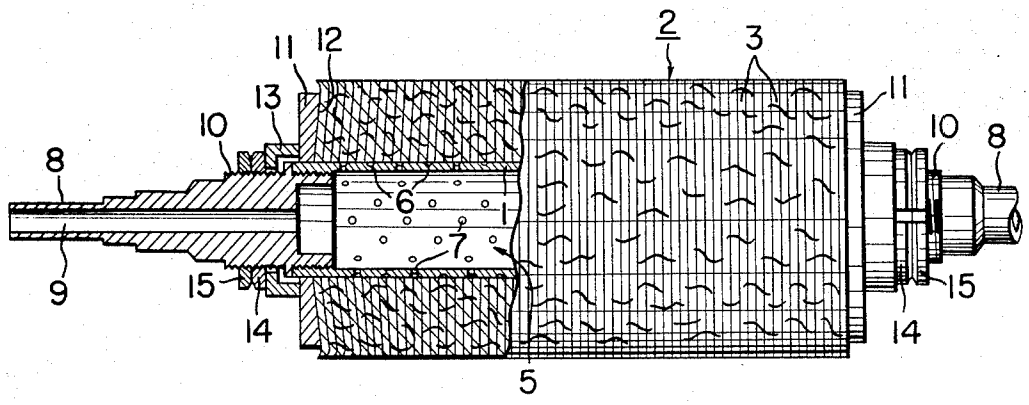


FIG. 2

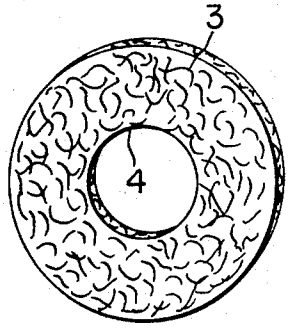


FIG. 4

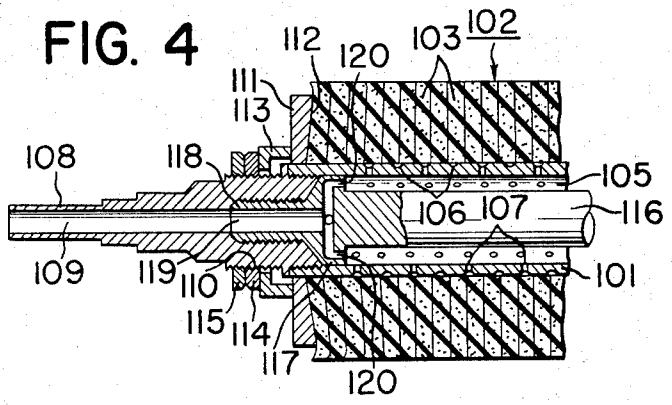
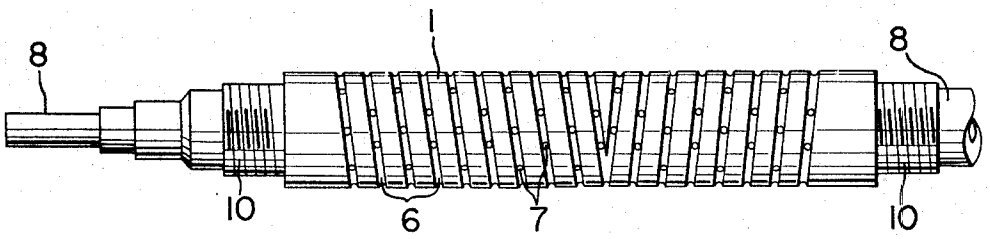


FIG. 3



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FIG. 5

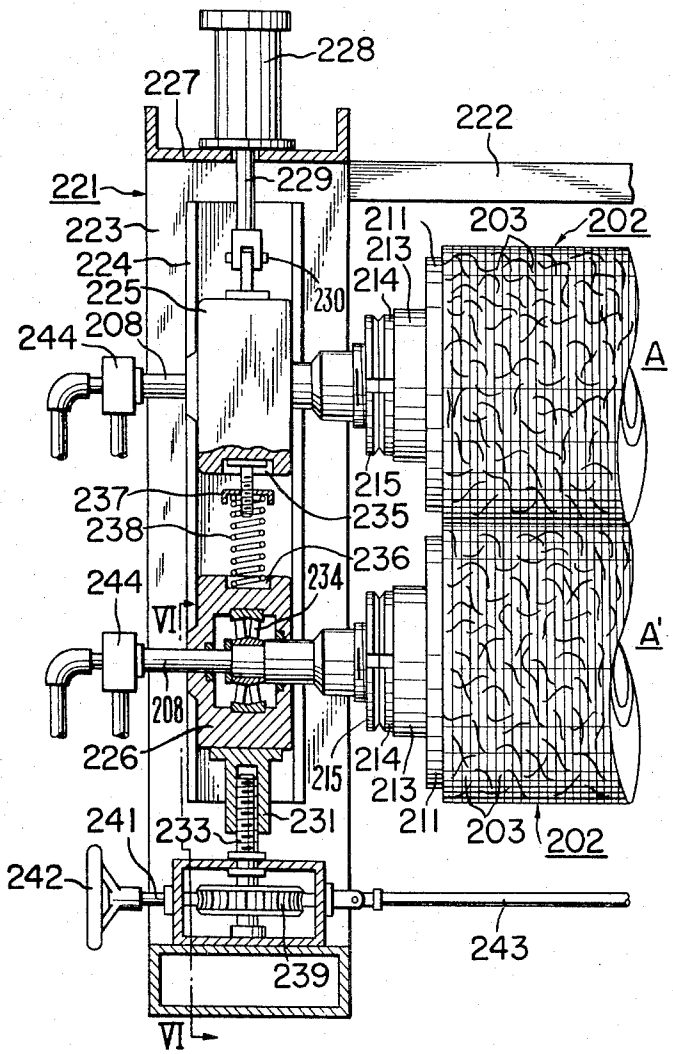


FIG. 7

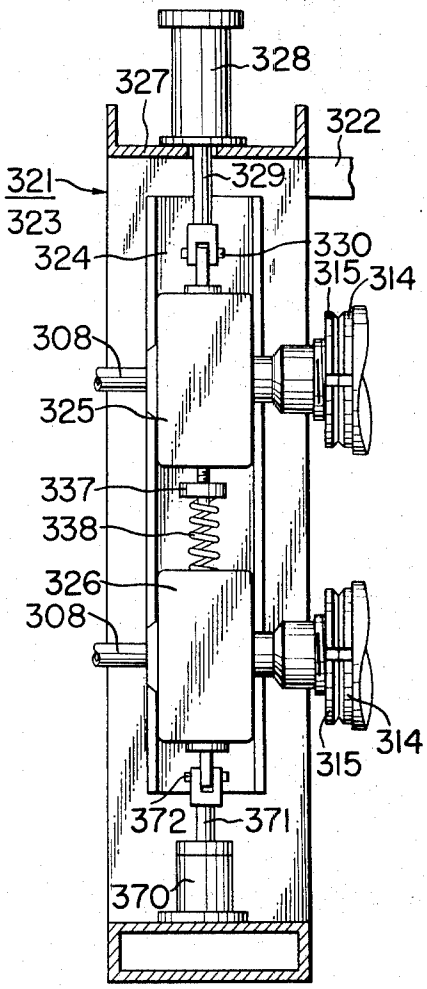
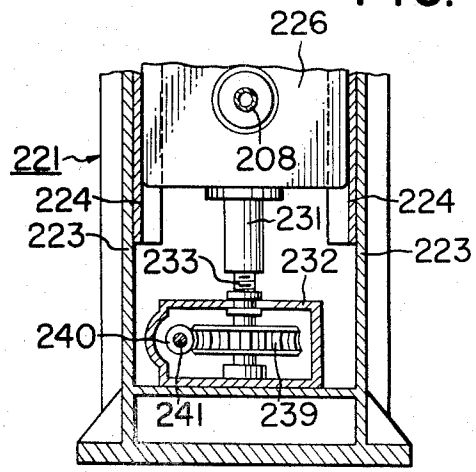


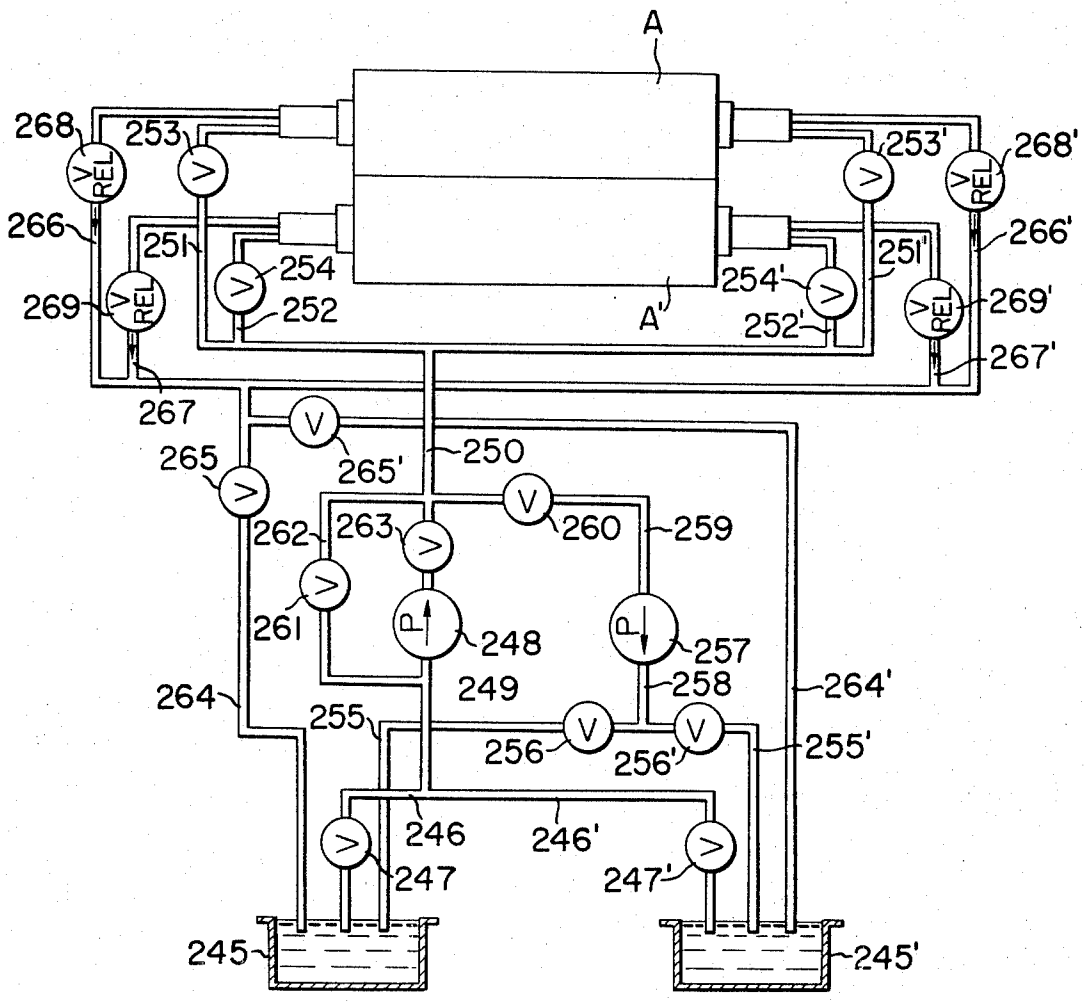
FIG. 6



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FIG. 8



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OILING ROLLER

This invention is concerned with an oiling roller and oiling device for use with metal sheets. More particularly, the invention is concerned with an oiling roller and oiling device for use with metal sheets after the sheets are pickled or while the sheets are on the shearing line, etc., in the rolling process.

Known means for oiling both sides of steel sheet in the rolling process are spraying means and coating means involving the employment of rubber-rollers. However, the former has the disadvantage that oil is wasted in large quantities and satisfactory oiling on the reverse side of the steel sheet is difficult. The latter has the disadvantage that oil is scattered by centrifugal force when the roller rotates at high speed.

This invention has overcome the disadvantages of the heretofore known oiling means for the metal sheet. The present invention provides a new and improved oiling roller and oiling device.

One of the features of the present invention is to provide an oiling roller comprising a hollow arbor having a plurality of small holes penetrating the arbor wall on the circumference thereof, an elastic porous pad in a cylindrical form placed over the circumference of said hollow arbor, and means for pressing the circumferential portion of said cylindrical pad in the axial direction of the same cylinder.

Thus, if said oiling roller is brought into contact with the surface of the metal sheet being fed and oil is introduced under pressure into the internal space of said hollow arbor, the oil introduced permeates through said small holes into the pad. Since the circumferential portion of the pad is pressed by said pressing means, the external exudation of said oil permeated is adequately controlled. Accordingly, when the oiling roller is caused to rotate the oil is prevented from scattering by centrifugal force. An adequate amount of oil is applied to the surface of the metal sheet.

The said elastic porous pad may preferably be non-woven fiber and spongy material such as sponge rubber, non-cellular type synthetic resin foam, and the like, having oil and thermal resistance.

Another feature of the present invention is to provide a device for oiling the surface of metal sheet. Such device comprises a pair of said oiling rollers for oiling both sides of the metal sheet, a means for movably supporting said oiling rollers in such a manner as to relatively contact and separate from each other. At least one air cylinder causes at least one of the oiling rollers to contact the other roller and imparts an air cushion to the said one oiling roller, and spring means are provided for causing said pair of oiling rollers to separate from each other.

Thus, said pair of oiling rollers are forced away from each other by the spring means at the same time while are forced toward each other by means of the air cushion of the air cylinder.

Even if the cross section of the metal sheet passing between the oiling rollers is uneven or wave-like, both oiling rollers can make appropriate movements according to such wave-like cross-section of the sheet, and both sides of the sheet are oiled evenly.

One object of the present invention is to provide an oiling roller capable of oiling metal sheet economically. Another object of the invention is to provide an oiling device capable of oiling evenly both sides of the metal sheet, even if such sheet is uneven.

The preferred embodiment of the present invention will be hereinafter described with reference to the accompanying drawings.

FIG. 1 is a view partially shown in cross section of the oiling roller.

FIG. 2 is a view in perspective of the porous tip.

FIG. 3 is a view in side elevation of the hollow arbor.

FIG. 4 is a view shown in cross section of another embodiment of the oiling roller partially omitting some components.

FIG. 5 is a view shown in cross section of the oiling device partially omitting some components thereof.

FIG. 6 is a view in section taken as indicated along the line VI—VI of FIG. 5.

FIG. 7 is a view shown in cross section of another embodiment of the oiling device partially omitting some components embodiment.

FIG. 8 is an oil pressure circuit diagram.

The preferred embodiment of the present invention is hereinafter described with reference to FIGS. 1 and 2.

The cylindrical pad 2 placed over the circumference of the hollow arbor 1 consists of a plurality of disk-shape non-woven fiber or porous rings having holes 4 in the center thereof as shown in FIG. 2, said rings being piled one upon the other.

The said non-woven fiber ring 3 can be made from such synthetic fibers as nylon, orlon, dacron, etc., such natural fibers as cotton, wool, hemp, etc., and/or such mineral fibers as asbestos, glass, etc. These fibers are mixed with each other at random and bound to each other by resinous adhessives having oil and heat resistance in such a manner as to have spaces among the fibers.

The following is a representative example of non-woven fiber.

Fiber: nylon filament (0.2–0.6mm in diameter)

Adhesive:

(1)

Primary resinous liquid mixture	
polyester resin	50g
toluendiisocyanate	50g
naphtha	30g
butyl acetate	70g

(2)

Secondary resinous liquid mixture	
phenol resin	70g
epoxide resin	10g
silicone resin	10g
cellosolve acetate	10g
metyl ethyl ketone	40g
ethyl acetate	10g
acid anhydride	0.5g

The said primary liquid mixture is sprayed to the fibers which are at random mixed with each other. After the mixture is dried, the secondary liquid mixture is sprayed thereto.

On the circumference of the said hollow arbor 1 are provided spiral grooves 6 running each other in opposite directions to each other with the central part of the arbor as the border. Further, within the said grooves 6 are provided a plurality of small holes 7 penetrating the arbor wall into the internal space of the hollow arbor.

The said hollow arbor 1 is further provided with stepped journals 8 extended at both ends thereof. Each journal is provided with a passage 9 running into the internal space of the said hollow arbor. Further, the male

thread **10** is provided on the circumference of the largest part of each journal contiguous to the end of the said hollow arbor. Press disks **11** for pressing the said pad **2** are formed in such a manner that the inner surface thereof has inclined surface **12** inclined toward the pad as shown in FIG. **1**. These two press disks are positioned at both ends of the hollow arbor **1** contiguous to both sides of said pad **2**. They are pressed toward the center by washers **13** and two push nuts **14** and **15** screwed on said male thread **10**.

Since the said pad is pressed by the inclined surfaces **12** of said two disks **11**, the circumferential area of the pad is pressed more tightly than the other portion thereof. Accordingly, the spaces among the fibers on the circumferential area of the pad become smaller and the exudation of oil is controlled.

Another example of the oiling roller will now be described with reference to FIG. **4**.

Into the hollow arbor is inserted the core arbor **116** the diameter of which is smaller than the inner diameter of the hollow arbor **101** and which has flanges **117** at both ends thereof. The screws **118** extended at both ends of said core arbor are screwed in the base of said journal **108**. Thus, there is provided the cylindrical inner space between the inner wall of the hollow arbor and the core arbor.

The screws **118** of said core arbor are provided with passages **119** connecting the passages **109** of said journals. The flanges **117** are provided with a plurality of conduits **120** which branch off from said passage **119** and connect with said cylindrical inner space **105**. In addition, the pad **102** comprises a plurality of porous rings piled upon each other, said rings being made of sequential type urethane foam. The numbers **106, 107, 110, 111, 112, 113, 114,** and **115** in FIG. **4** refer to the parts which are substantially the same as illustrated in FIG. **1**.

When the oiling roller of this example is brought into contact with the surface of the metal sheet being fed and when oil is introduced under pressure into the cylindrical inner space **105**, the amount of oil contained in the hollow arbor is small. Therefore, the permeation of oil into the pad is hardly affected by the centrifugal force when the said oiling roller is rotated. A nearly fixed amount of oil is thus fed into the pad. Further, since no air is contained within the said cylindrical inner space or if air is contained therein, the amount would be small, the oiling roller hardly vibrates. Accordingly, oil is almost evenly applied to the metal sheet.

An oiling device provided with either one of the aforementioned oiling rollers is hereinafter described with reference to FIG. **5** and FIG. **6**.

The frame consists of two supporting towers **221** and the beams **222** connecting said towers.

In FIG. **5**, only one of the towers is shown. But the other tower is of the same construction. On both walls **223** of the tower are vertically placed channel-type guide plates **224** in such a manner as to face each other. Two bearing boxes **225** and **226** are supported between the guide plates so that they may be free to travel vertically.

The upper bearing box **225** is connected by means of pin **230** with the lower end of the ram **229** of air cylinder **228** supported on the upper plate **227** of the tower. The bearing box **225** is caused to move up and down by the operation of the air cylinder. When it is not in motion, it is subjected to the air-cushion of the air cylinder.

The lower bearing box **226** is provided with the sleeve **231** having therein a female thread at the lower end thereof. In this sleeve is screwed screw shaft **233** of the fine adjustment **232** fixed on the tower bed. On the bearings **234** within the bearing boxes **225** and **226** are rotatively supported each journal **208** of a pair of oiling rollers A and A'. There are also provided dents **235** and **236** respectively on the lower side of the bearing box **225** and the upper side of the bearing box **226**. Spring shoe **237** is inserted in one dent **235** and spring **238** is inserted between this spring shoe and the other dent **236** for elastically supporting the upper oiling roller and the bearing box **225**. Rotary joints **244** are respectively connected with the ends of said journal. With these rotary joints are connected oil pipes.

The said fine adjustment **232** is provided with a worm wheel **239** fixed on the lower end of said screw shaft **233** and a worm **240** which gears therewith. The handle **242** is fixed on one end of the said worm shaft **241** and connecting rod **243** is connected by means of a pin with the other end of the said shaft.

The other supporting tower is provided with the same guide plates, bearing boxes, air cylinder, spring and fine adjustment as mentioned above. On the two bearing boxes of the other tower are respectively supported the other journals of a pair of said oiling rollers. To the worm shaft of the other fine adjustment is connected the other end of said connecting rod **243**.

The rotation of said handle **242** is conveyed to the screw shaft **233** by way of worms **240**, and worm wheels **239** of both fine adjustments. The rotation of said screw shaft causes the sleeve **231** to move up and down. In accordance therewith, the lower oiling roller A' moves up and down.

In operation, after properly adjusting the position of the lower oiling roller A' relative to the pass-line of the metal sheet, the bearing box **225** is caused by the operation of the air cylinder to move either up or down in order to properly position the upper oiling roller A. The desired position is that which causes the pad **202** of the upper roller to slightly touch that of the lower roller. If, in such position, the metal sheet is caused to pass between the oiling rollers A and A', both rollers rotate by means of friction and the oil contained in the pads is applied to both sides of the metal sheet.

An oil pressure circuit for the aforementioned oiling device will now be described with reference to FIG. **8**.

Pipes **246** and **246'** respectively connected with two oil tanks **245** and **245'** are connected with the input pipe of the oil pump **248** by way of the magnetic valves **247** and **247'**. The pipes **251** and **252** and the pipes **251'** and **252'** respectively connected with the output pipe of said oil pump are connected with each of a pair of oiling rollers by way of magnetic valves **253** and **254** and magnetic valves **251'** and **252'**.

Further, pipes **255** and **255'** connected with said oil tanks **245** and **245'** are respectively connected with the input pipe **258** of the vaccum pump **257** by way of magnetic valves **256** and **256'**. The output pipe **259** of said vaccum pump is connected with the output pipe **250** of said oil pump by way of magnetic valve **260**. Further,

the input pipe **249** and output pipe **250** of said oil pump are connected with each other by means of pipe **262** having therein stop-valve **261**. Said output pipe **250** has magnetic valve **263** between oil pump **248** and the junction of said pipe **250** and pipes **259** and **262**.

Further, a pressure adjustment circuit is added to said circuit. The pipes **264** and **264'** connected with said oil tanks **245** and **245'** are respectively connected with pipes **266** and **267** and pipes **266'** and **267'** by way of magnetic valves **265** and **265'**. Pipes **266** and **267** and pipes **266'** and **267'** are respectively connected with each journal of a pair of said oiling rollers by way of pressure relief valves **268, 269, 268'**, and **269'**.

Oil tanks **245** and **245'** are filled with oils which may vary according to the intended purpose, such as for example, oil which is different in viscosity, oil which is different in drying speed, etc.

When the oil in the oil tank **245** is used in said oil pressure circuit, magnetic valves **247, 263, 253, 253', 254, 254'**, and **265** are caused to open to operate the oil pump **248**. The oil of the oil tank **245** is fed under pressure into the internal space of the hollow arbor. When the oil pressure within said internal space becomes higher than the fixed pressure, pressure relief valves **268, 268', 269**, and **269'** automatically open, and the oil within said internal space returns to the oil tank **245**.

When the oil in oil tank **245'** is used, the oil pump is first stopped and magnetic valves **263, 253, 253', 254, 254', 256, 260**, and stop valve **261** are caused to open to operate the vaccum pump **256**. The oil in oiling rollers A and A', oil pump **248** and pipes connected therewith return to the oil tank **245**. Then, magnetic valves **247', 263, 253, 253', 254**, and **254'** are caused to open to operate the oil pump **248**. The oil of the oil tank **245'** is then fed under pressure to the oiling rollers.

Another embodiment of the oiling device support structure is illustrated in FIG. 7. The lower bearing box is connected by means of pin **372** with ram **371** of the air cylinder **370** vertically supported on the bed of the supporting tower **321** in place of the fine adjustment. The numbers **305, 314, 315, 322, 323, 324, 325, 327, 328, 329, 330, 337**, and **338** refer to the parts which are substantially the same as illustrated in FIG. **5** and FIG. **6**.

In this example of the embodiment, a pair of oiling rollers A and A' are subjected to the air cushions of air cylinders **328** and **370**.

What I claim is:

1. An oiling roller comprising a hollow arbor having a plurality of spiral grooves on the circumference thereof, said spiral grooves running in opposite directions with the axial center of said arbor as the border, and a plurality of small holes passing from the interior of said arbor to said grooves; a cylindrically shaped non-woven fiberous elastic porous pad placed over the circumference of said hollow arbor; and a disk positioned at each end of said arbor contiguous to each end of said pad, each disk having a side thereof confronting the end of said pad and inclined toward said pad, whereby the circumferential portion of said pad is pressed in the axial direction of said arbor towards the center of said arbor.

2. An oiling roller according to claim **1** in which said pad is comprised of a plurality of ring shaped disks piled one upon the other to form the cylindrical shape.

3. An oiling roller according to claim **1** further comprising a core arbor positioned within said hollow arbor such that a cylindrically shaped space is formed between the two arbors.

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