Feb. 26, 1963 C. W. MINTON 3,078,960

LUBRICATING SYSTEM FOR KNITTING MACHINES AND THE LIKE

Filed May 31, 1961 4 Sheets-Sheet 1

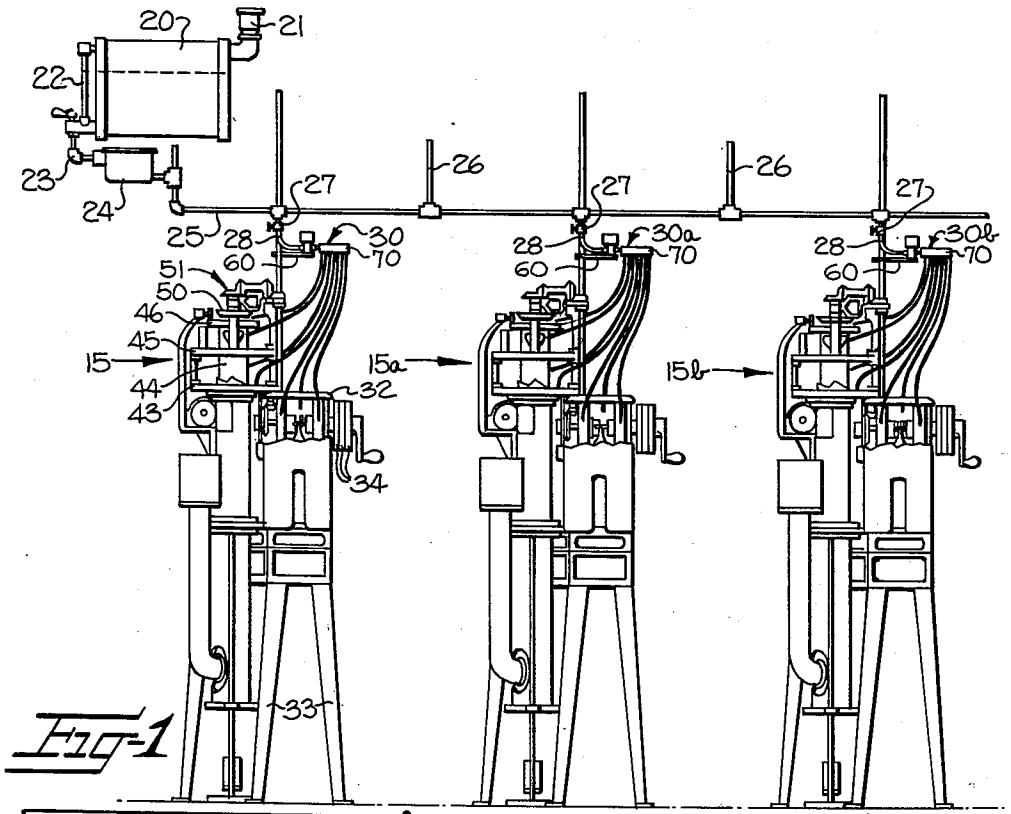

Fig-1

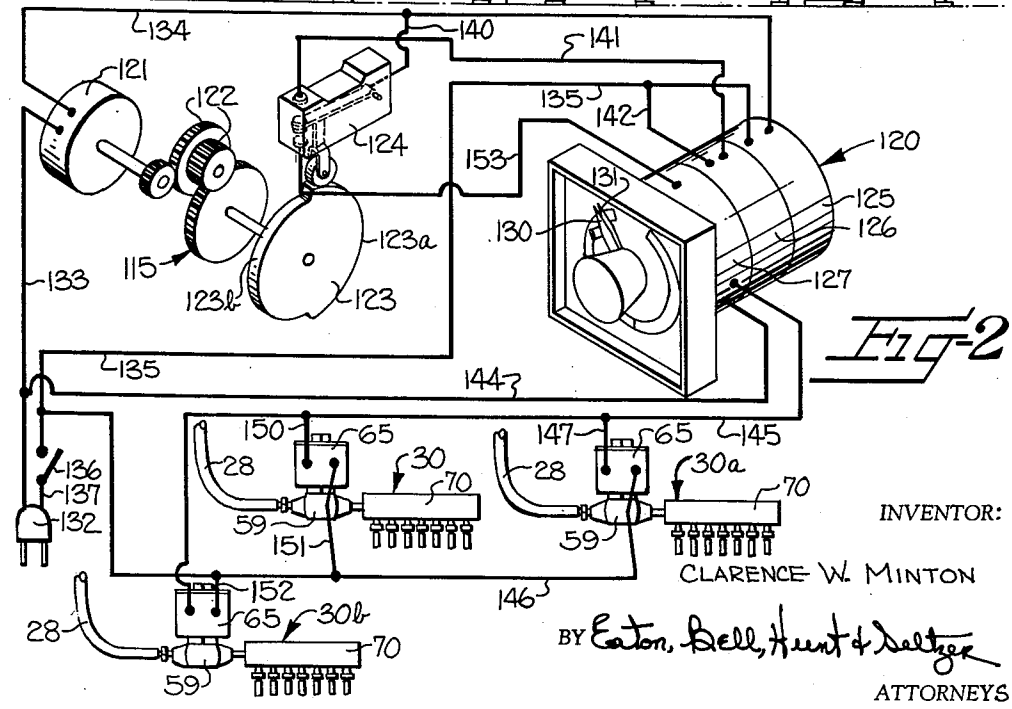

Fig-2

INVENTOR:
CLARENCE W. MINTON
BY Eaton, Bell, Hunt & Deltzer
ATTORNEYS

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LUBRICATING SYSTEM FOR KNITTING MACHINES AND THE LIKE

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Fig-3

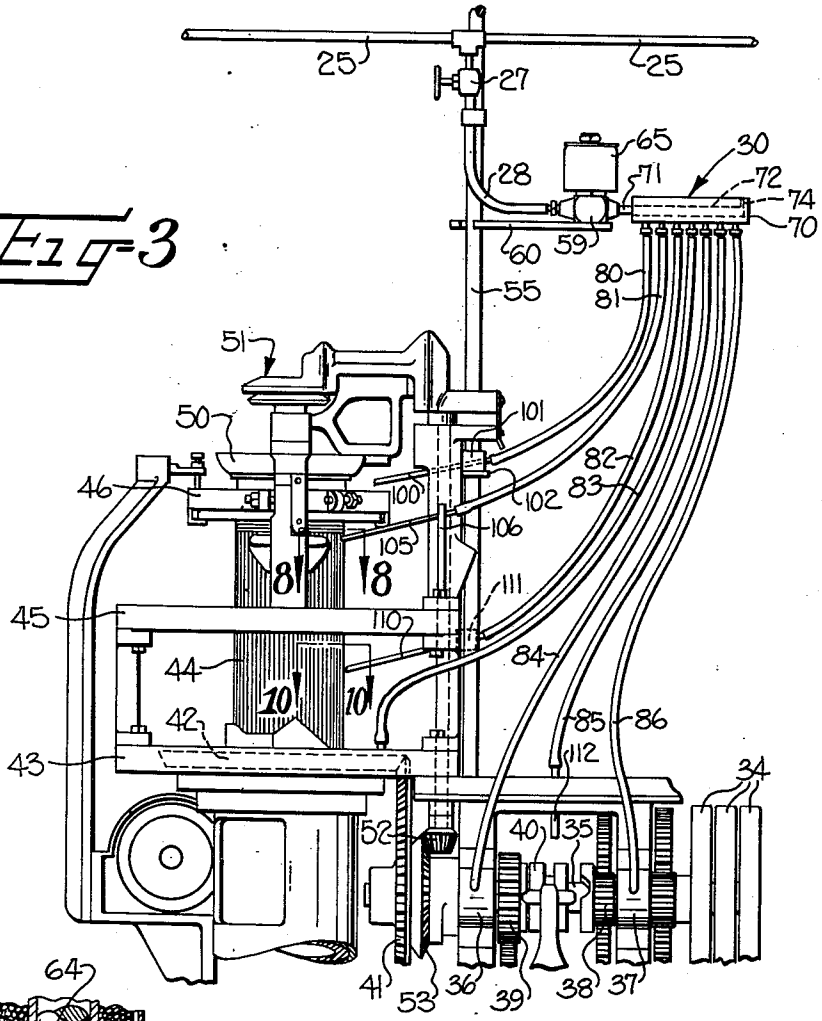
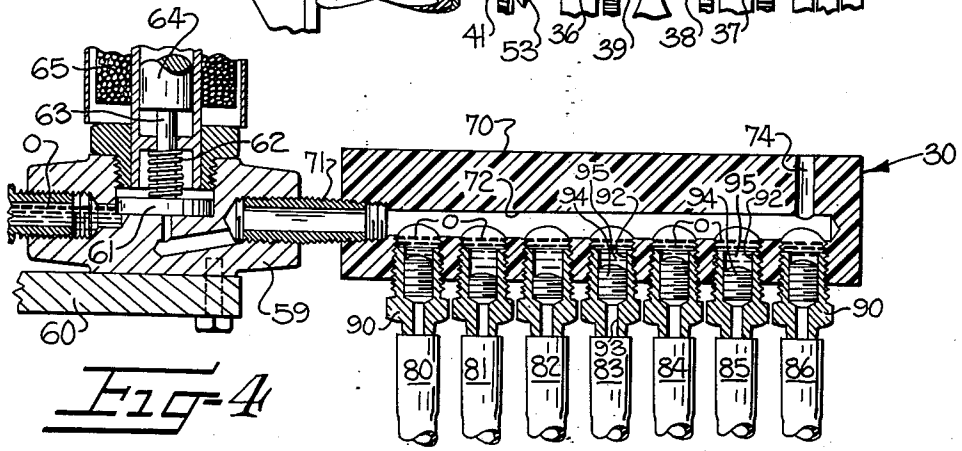


Fig-4



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LUBRICATING SYSTEM FOR KNITTING MACHINES AND THE LIKE

Filed May 31, 1961 4 Sheets-Sheet 3

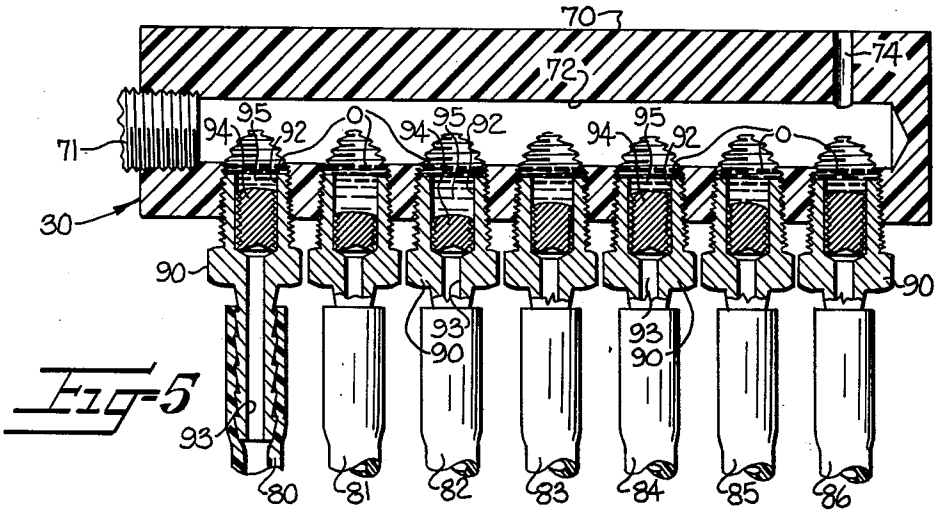

Fig-5

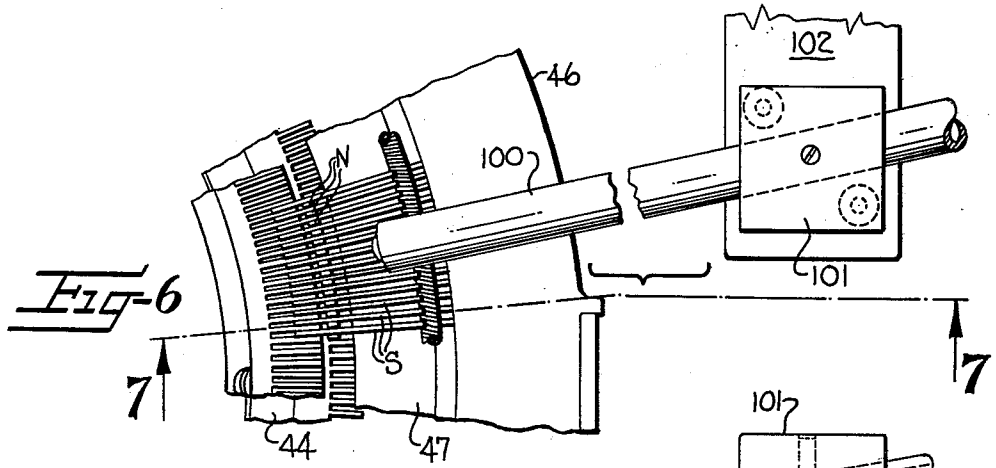

Fig-6

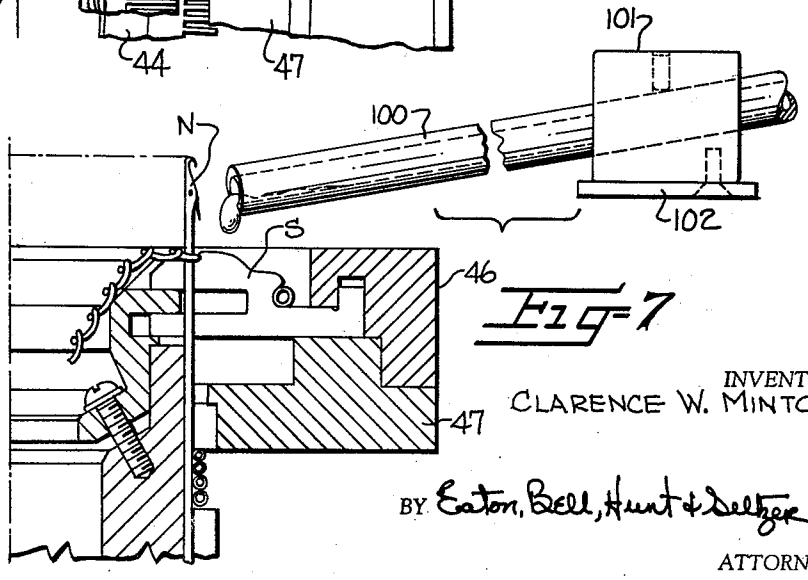

Fig-7

INVENTOR:
CLARENCE W. MINTON

BY Eaton, Bell, Hunt & Deltzer

ATTORNEYS

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LUBRICATING SYSTEM FOR KNITTING MACHINES AND THE LIKE

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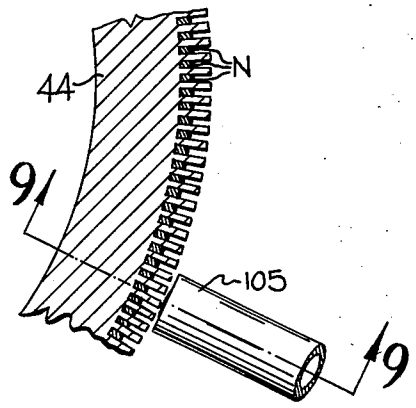

Fig-8

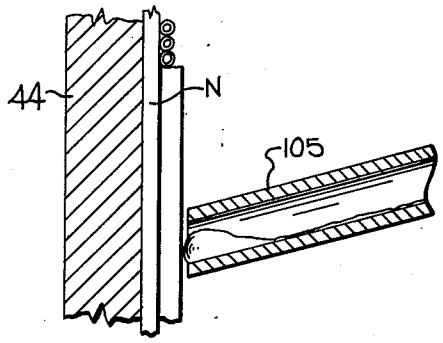

Fig-9

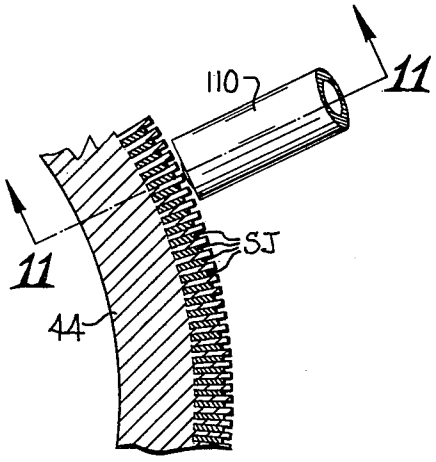

Fig-10

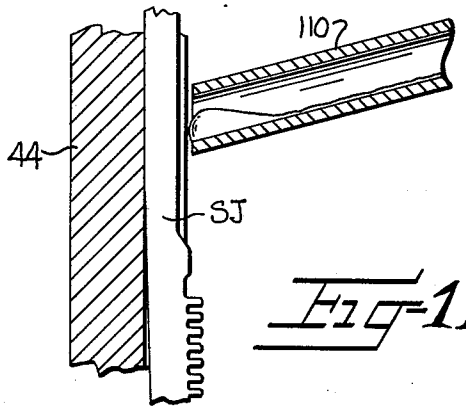

Fig-11

INVENTOR:
CLARENCE W. MINTON

BY Eaton, Bell, Hunt & Seltzer
ATTORNEYS

United States Patent Office 3,078,960 Patented Feb. 26, 1963

3,078,960
LUBRICATING SYSTEM FOR KNITTING MACHINES AND THE LIKE

Clarence Webb Minton, Nashville, Tenn., assignor to Morpul, Incorporated, Greensboro, N.C., a corporation of North Carolina

Filed May 31, 1961, Ser. No. 113,742
2 Claims. (Cl. 184—31)

This invention relates to a lubricating system for knitting machines which is adapted to automatically supply adequate but not superfluous amounts of lubricant to a plurality of machines while they are operating to thereby avoid over-lubrication. The present lubricating system is particularly adapted to intermittently deliver a measured quantity of lubricant to each machine and then distribute these measured quantities of lubricant to various points or portions of each of the machines in measured amounts, according to the requirement of the particular portion lubricated.

Although the present automatic lubricating system is shown and described in connection with a plurality of circular knitting machines, it is to be understood that the lubricating system may be used in connection with the automatic lubrication of other types of machines, such as sewing machines and the like.

It is well known that circular knitting machines require periodic lubrication in order to minimize wear of the parts and to insure proper operation of the machine to produce fabric of uniform quality. The proper lubrication of fine gauge circular knitting machines of the type used to knit ladies' sheer hosiery is extremely important to insure that this type of machine continuously produces uniform fabric. Most circular knitting machines for producing ladies' sheer hosiery are currently being manually lubricated at periodic intervals and the amounts of lubricant applied to each part of each machine is dependent upon the skill of the person applying the lubricant. Consequently, some parts of a machine receive too much lubrication while others do not receive enough and the amount of lubricant applied to the machines will vary from machine to machine. It is well known that when too much lubricant, usually in the form of a liquid such as oil, is applied to a knitting machine, the oil is transferred to the fabric and the yarn to thereby contaminate the knit goods, and when not enough oil is applied, the machine parts will wear and may not operate properly. Also, when oil is manually applied to the machine, a considerable amount of oil is wasted and eventually accumulates on the floors to provide a fire and accident hazard.

It has been proposed in U.S. Patents Nos. 2,725,734 and 2,882,705 to provide lubricating systems for a single knitting machine and in both of these patents, lubricating material is supplied to various points on the knitting machine. In Patent No. 2,725,734, a lubricating plasticizer is applied to the machine and the fabric is knit with pre-plasticized yarn so that the yarn and fabric are not contaminated by the lubricant, as they would be if the machine were lubricated with mineral oil or the like. In Patent No. 2,882,705, a conventional type of lubricant, such as oil, is sprayed in mist form onto several points of the machine. In both of these patents, a reservoir of lubricant is provided on each machine and while these lubricating systems may be effective to obviate the necessity of an operator oiling each particular point on each machine periodically, the operator must still give close attention to the reservoir to make sure that sufficient lubricant is always contained therein.

With the foregoing in mind, it is a primary object of the present invention to provide a lubricating system for automatically lubricating a plurality of knitting machines

which requires a minimum of attention, which can be easily and economically installed, and which supplies the exact amount of lubricant required by each part of each machine.

It is another object of the present invention to provide a lubricating system which includes a single lubricant reservoir which periodically feeds a measured amount of lubricant to a lubricating unit attached to each knitting machine and then each of the lubricating units distributes the required amount of lubricant to each part of the knitting machine.

It is another object of the present invention to provide a lubricating system of the type described wherein the lubricating unit at each of the machines is provided with lubricant transmission conduits or tubes which direct the lubricant to various points on the knitting machine and wherein each lubricating unit is provided with means for varying the amount of lubricant fed to each point, in accordance with requirements of that particular part of the machine.

It is a more specific object of the present invention to provide means for supplying a uniform amount of lubricant to a vertically positioned rotating part of a knitting machine, such as the needle cylinder, which includes an inclined tube having its free end disposed closely adjacent the rotating needle cylinder so that lubricant periodically supplied to the tube will run down the tube to form a droplet which is contacted by the rotating needle cylinder to draw the lubricant from the tube and uniformly apply it to the cylinder.

It is another specific object of the present invention to provide a lubricating system of the type described having lubricant distributing means at each knitting machine which includes a manifold block having a single inlet port and a plurality of communicating outlet ports which direct the lubricant to various portions of the knitting machine and wherein lubricant control elements are associated with each of the outlet ports and function to determine the amount and rate of flow of lubricant supplied to the parts of the machine communicating with the corresponding outlet ports.

It is a more specific object of the present invention to provide an automatic lubricating system for simultaneously supplying liquid lubricant to a plurality of knitting machines and the like which includes a main lubricant supply reservoir, a main lubricant supply line connected at one end to the reservoir and extending adjacent each of the knitting machines, a lubricant distributing manifold associated with each of the knitting machines and communicatively connected to the main lubricant supply line, valve means positioned between the lubricant distributing manifold and the main lubricant supply line, a single timing unit operatively connected to each of the valve means and operable periodically to simultaneously actuate the valve means and periodically permit predetermined amounts of lubricant to flow from the main lubricant supply line and into the manifolds, a plurality of lubricant distributing lines connected at one end to the manifolds and extending to various parts of the knitting machines to direct the flow of lubricant from the manifolds to corresponding parts of the knitting machines to be lubricated, and metering means associated with the manifolds for determining the amount and rate of flow of lubricant passing into each of the lubricant distributing lines.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a front elevation showing a few of the endmost knitting machines of a row and illustrating the

manner in which the present lubricating system is connected to each of the knitting machines;

FIGURE 2 is a somewhat schematic wiring diagram illustrating the manner in which the lubricating units at each knitting machine are simultaneously actuated by the electrical timer unit;

FIGURE 3 is an enlarged fragmentary view of the upper portion of one of the knitting machines shown in FIGURE 1, illustrating the manner in which the lubricating unit is attached to the knitting machine and showing the manner in which the lubricant transmitting lines are connected to the various portions of the kniting machine to be lubricated thereby;

FIGURE 4 is an enlarged longitudinal vertical sectional view through the manifold block and the inlet valve of the lubricating unit shown in the upper portion of FIGURE 3;

FIGURE 5 is a greatly enlarged vertical sectional view similar to the right-hand portion of FIGURE 4;

FIGURE 6 is a fragmentary plan view of a portion of the sinker cap and showing the free end of the tube which supplies lubricant to the sinkers carried therein;

FIGURE 7 is a vertical sectional view through the sinker cap and the free end of the lubricant supply tube, being taken substantially along the line 7—7 in FIGURE 6;

FIGURE 8 is a fragmentary sectional plan view through the upper portion of the needle cylinder and showing the position of the free end of the tube which supplies lubricant to the needles carried therein, being taken substantially along the line 8—8 in FIGURE 3;

FIGURE 9 is a vertical sectional view taken substantially along the line 9—9 in FIGURE 8;

FIGURE 10 is a fragmentary sectional plan view taken through the lower portion of the needle cylinder and showing the position of the free end of the tube which supplies lubricant to the selector jacks carried therein, being taken substantially along the line 10—10 in FIGURE 3;

FIGURE 11 is a vertical sectional view taken substantially along the line 11—11 in FIGURE 10.

Referring to FIGURE 1, it will be noted that three knitting machines, broadly indicated at 15, 15*a* and 15*b* are shown, however, it is to be understood that the lubricating system of the present invention is preferably connected to a large number of knitting machines. Although any desired type of lubricating fluid may be utilized with the present lubricating system, the lubricant usually consists of a relatively thin or light-weight lubricating oil of an appropriate type for oiling the particular machine concerned. For convenience, the liquid lubricant will hereinafter be referred to as "oil," this term being used in a generic sense and intended to include any type of lubricant which may be desired.

The present lubricating system includes a main oil supply reservoir 20 (FIGURE 1) which is provided with a filling spout 21, a liquid level sight gauge indicator 22 and an outlet pipe 23. The outlet pipe 23 leads to one side of a float chamber which contains a float operated valve, not shown, which maintains a constant level of oil in the float chamber 24. One end of a main supply line 25 is connected to the other side of the float chamber 24 and extends adjacent each of the knitting machines 15, 15*a* and 15*b* to be lubricated.

Upstanding vent pipes 26 are provided at intervals along the main supply line 25 and prevent air locks from forming in the supply line 25 as the oil is supplied to the knitting machines. One side of a manually operable cut-off valve 27 is connected to the main supply line 25 at each of the knitting machines and the other side of the valve 27 is connected to one end of branch or feeder supply lines 28 (FIGURE 3) at each of the knitting machines.

The lower ends of the branch supply lines 28 are connected to individual lubricating units broadly indicated at 30, 30*a* and 30*b*, which are attached to the respective knitting machines 15, 15*a* and 15*b*. Each of the lubricating units 30, 30*a* and 30*b* and the corresponding knitting machines 15, 15*a* and 15*b* are identical and, therefore, only the lubricating unit 30 and the knitting machine 15 will be described and like reference characters will apply to corresponding parts of the units 30*a* and 30*b*, associated with the respective knitting machines 15*a* and 15*b*.

Each of the lubricating units is adapted to supply the proper amount of lubricating oil to various portions of a circular knitting machine of the type adapted to knit ladies' sheer hosiery or the like. The type of knitting machine shown in the drawings is of the type manufactured by Scott & Williams of Laconia, New Hampshire and known as their Model KN. However, it is to be understood that the lubricating units may also supply lubricant to other types of knitting machines, sewing machines or the like.

The knitting machine 15, shown in FIGURES 1 and 3, includes a frame 32 which is supported on suitable legs 33 and the frame 32 houses the usual driving mechanism of the knitting machine. The driving mechanism includes the usual belt driven pulleys 34 (FIGURE 3) which are conventionally connected to a main drive shaft 35. The main drive shaft 35 is mounted for rotation in bearing members 36 and 37 on the front portions of the frame 32. A rotary drive pinion 38 and a reciprocatory drive pinion 39 are supported on the main shaft 35 and are adapted to be alternately engaged by a clutch element 40 in a conventional manner to impart rotary or reciprocatory motion to a main drive bevel gear 41.

The main drive bevel gear 41 meshes with a cylinder bevel gear 42 which is mounted for rotation in a lower bed plate 43 (FIGURE 3). The lower bed plate 43 is suitably supported on the frame 32 and supports a slotted cylinder 44 which is driven by the bevel gear 42. The cylinder 44 extends upwardly through an upper bed plate 45 and has a sinker cap 46 supported on its upper end (FIGURES 3 and 7). The sinker cap 46 is provided with a slotted sinker bed 47 which has a plurality of spaced apart sinkers S supported for radial movement therein. The sinkers S cooperate with needles N in a conventional manner to form stitches of the yarn fed to the needles. The needles N are supported for independent vertical movement in radially spaced slots of the cylinders 44 and in the area between the upper bed plate 45 and the sinker cap 46.

A latch ring 50 (FIGURE 3) is suitably supported above the sinker cap 46 and supports the usual dial, not shown, and the dial driving mechanism, broadly indicated at 51, which rotates the dial in a conventional manner. The dial driving mechanism 51 is driven by a bevel gear 52 (FIGURE 3) which engages a mating bevel gear 53 suitably secured on one face of the bevel gear 41. The knitting machine is also provided with an upstanding yarn support post 55, the lower end of which is suitably secured in the frame member 32 and the upper end of which normally supports the yarn bobbins and the yarn guides, not shown, in a conventional manner. The slotted cylinder 44 also contains needle jacks, not shown, and selector jacks SJ (FIGURE 11) which are positioned beneath the needles N and which generally occupy a position in the cylinder 44 between the lower bed plate 43 and the upper bed plate 45.

The lubricating unit 30 (FIGURE 4) includes an electrically operable valve which has a valve housing 59 that is fixedly supported on one end of a support bar 60. The other end of the support bar 60 extends to and is suitably connected on the support post 55 (FIGURE 3). The valve housing 59 contains a valve member 61 (FIGURE 4), the lower end of which is resiliently urged into the closed position by a compression spring 62 which surrounds an upstanding stem portion 63. The upper end of the stem portion 63 has a core member 64

mounted for vertical movement in the center of an electrical coil 65. When electrical energy is introduced to the coil 65, in a manner to be later described, the core 64 and the valve member 61 will be raised upwardly to let oil, indicated at O, flow from the branch supply line 28, through the valve housing 59 and into a lubricant distributing manifold block 70.

The manifold block 70 is connected to the valve housing 59 by a threaded inlet nipple 71 which communicates with one end of a main supply bore 72 extending longitudinally of the manifold block 70. The right-hand end of the bore 72 (FIGURES 4 and 5) is connected to the atmosphere by the drilled vent passageway 74. The manifold block 70 is preferably formed of clear plastic material, however, it may be formed of metal, if desired.

The upper ends of a plurality of oil distributing lines or tubes 80 through 86 (FIGURES 3, 4 and 5) are communicatively connected with the supply bore 72 in the manifold block 70 by suitable outlet couplings or fittings 90. It will be noted in FIGURE 5 that the upper ends of the fittings 90 are threadably embedded in the block 70 and the lower ends have serrated stems which receive the upper ends of the tubes 80–86. The upper ends of the fittings 90 are provided with metering means for measuring the amount and controlling the rate of flow of the oil O from the supply bore 72 and into the tubes 80–86. To this end, each fitting 90 is provided with a drilled counterbore 92 which communicates with the upper end of an oil passageway 93 extending to the lower portion of the fitting 90.

A measuring and flow control element 94 is positioned in the counterbore 92 of the fitting 90 and functions to measure the amount of oil which is fed to each of the distributing lines 80–86 and also acts to determine the rate of flow of the oil from the manifold block and through the distributing lines 80–86. The space above the measuring and flow control element 94 defines an oil distributing pocket or chamber 95 into which a predetermined amount of oil is deposited each time that the valve seat 61 is opened to let a predetermined amount of oil pass into the bore 72 of the manifold block 70.

In the present instance, the measuring and flow control elements 94 are formed of externally threaded plugs which have a slightly smaller outside diameter than the internal diameter of the counterbore 92 in the fitting 90. Thus, when oil flows into the oil distributing chamber 95, it flows down the threads on the outside of the flow control element 94 and into the passageway 93 from which it flows into the corresponding oil distributing lines 80–86, to be distributed to various portions of the knitting machine, in a manner to be later described. It is to be understood that the plugs 94 need not necessarily be externally threaded as they may have smooth sides, they may be splined or provided with longitudinal slots or holes which will provide restricted openings through which the oil flows to thereby control the rate of flow. It will be understood that the amount of clearance between the external diameter of the flow control plug 94 and the internal diameter of the counterbore 92 in the fitting 90 may be varied to control the rate of flow of the oil. It has been found that with .005 of an inch clearance most knitting machine oils will flow from the chamber 95 in approximately one-half hour.

As shown in FIGURE 5, the length of the flow control elements 94 vary so that chambers 95 of varying sizes are provided in the upper ends of the fittings 90. Thus, the length of the elements 94 will determine the amount of oil O initially deposited in each of the chambers 95 when the valve seat 61 is periodically opened and the amount of clearance between the elements 94 and the counterbore 92 will determine the length of time required for the oil to flow out of the chambers 95.

Referring to FIGURES 3, 6 and 7, it will be noted

that the lower end of the oil distributing line 80 is connected to the outer end of an oil applicator pipe 100. The medial portion of the pipe 100 is fixed in a block 101 which is in turn fixed on the forward end of a support bar 102. The rear end of the support bar 102 is suitably connected to the support post 55. The inner end of the pipe 100 terminates closely adjacent the circle of needles N and above the sinkers S carried in the sinker cap 46 and sinker bed 47 (FIGURE 7). The block 101 supports the pipe 100 at approximately a 10° angle so that the oil deposited in the upper end of the line 80 will slowly flow down and drip out of the free end of the pipe 100 to be deposited upon the sinkers S as they pass therebeneath.

Referring to FIGURES 3, 8 and 9, it will be noted that the lower end of the oil distributing line 81 is connected to the outer end of an oil applicator pipe 105. The medial portion of the pipe 105 is supported in the upper end of an upstanding post 106 (FIGURE 3), the lower end of which is supported on the upper bed plate 45. The pipe 105 is supported in the bracket 106 so that it is inclined downwardly toward the cylinder 44 at substantially a 15° angle from the horizontal. The inner end of the pipe 105 is positioned closely adjacent the periphery of the cylinder 44 (FIGURES 8 and 9) and its free end is cut at an angle which corresponds to the vertical outer periphery of the rotating cylinder 44. It is preferred that the inner free end of the applicator pipe 105 be positioned approximately one thirty-second of an inch away from the periphery of the cylinder and that the inside diameter of the pipe 105 be approximately three-sixteenths of an inch. As the oil O slowly flows from the chamber 95 at the upper end of the line 81, it flows down and into the pipe 105. The surface tension of the oil O causes the same to form a droplet at the free open end of the pipe 105 (FIGURE 9). As the droplet of oil extends out of the free end of the pipe 105, it is contacted by the rotating cylinder 44 and the oil is drawn out of the pipe and evenly distributed around the cylinder.

After one oil droplet has been drawn out of the pipe 105 by the rotating cylinder, another droplet will form at the lower free end of the inclined oil applicator pipe 105 and this process is repeated until all of the oil deposited in the chamber 59 at the upper end of the line 81 is applied to the needle cylinder 44. It will be noted that the free end of the pipe 105 is positioned closely adjacent the periphery of the cylinder 44, preferably one thirty-second of an inch away, so that the free end of the pipe 105 does not engage the cylinder 44 and therefore cannot damage the same. The oil deposited around the periphery of the cylinder 44 by the pipe 105 serves to lubricate the needles N positioned in the slots in the upper portion of the cylinder 44 and as the oil works its way downwardly along the needles, it will lubricate the operating butts, not shown, and the cams engaged thereby.

Referring to FIGURES 3, 10 and 11, it will be noted that the lower end of the oil distributing line 82 is suitably connected to the outer end of an oil applicator pipe 110. The medial portion of the pipe 110 is suitably supported in a block 111 (FIGURE 3) secured to the lower surface of the upper bed plate 45. The pipe 110 is supported at an inclined angle of substantially 15° from the horizontal and its inner free end is positioned closely adjacent the periphery of the cylinder 44. The inner free end of the pipe 110 is cut at an angle which corresponds with the vertical outer surface of the slotted cylinder 44 (FIGURE 11).

As the oil O flows down the line 82 and inclined applicator pipe 110, the surface tension of the oil causes the same to form into a droplet in the end of the pipe 110. As the droplet increases in size it protrudes outwardly from the free end of the pipe 110 and is engaged by the rotating cylinder 44. As the surface of

the oil droplet engages the rotating cylinder 44, it is drawn outwardly from the pipe 110 and evenly distributed around the rotating cylinder.

As the droplets of oil are distributed around the cylinder 44 by the applicator pipe 110, lubricant is applied to the selector jacks SJ (FIGURE 11) positioned in the cylinder 44. The oil will flow down the cylinder slots and the selector jacks SJ and lubricate the conventional selector fingers which actuate the jacks and the cams which are engaged by the lower ends of the jacks.

Referring to FIGURE 3, it will be noted that the lower end of the distributing line 83 is suitably connected to an upstanding fitting which is supported in the lower bed plate 43 and communicates with the rotating bevel gear 42 mounted in the lower bed plate 43. As oil is slowly deposited in the distributing line 83, it flows downwardly and is fed to the rotating bevel gear 42 to keep the same lubricated as it drives the cylinder 44 in a conventional manner.

The lower ends of the oil distributing lines 84 and 86 are suitably connected to the main shaft bushings 36 and 37 (FIGURE 3). As oil is periodically deposited in the upper ends of the lines 84 and 86, it slowly flows down these lines and is supplied to the bushings 36 and 37 to keep the main shaft 35 lubricated as it rotates therein.

The lower end of the oil distributing line 85 is suitably connected to the upper end of a vertically disposed applicator pipe 112 (FIGURE 3). The medial portion of the tube 112 is supported in the frame 32 and the lower end thereof terminates in spaced relation above the clutch element 40. As oil is periodically deposited in the upper end of the line 85, it slowly flows down the same and drops out of the lower end of the pipe 112 and onto the clutch element 40 to lubricate the same on the main shaft 35.

If desired, the manifold block 70 may be lengthened and an additional oil distributing line connected thereto to supply lubricant to other portions of the machine than those illustrated. Also, the lines 80–86 may be connected to parts of the machine other than those shown, if desired.

In order to periodically open the valve seat 61 (FIGURE 4) for a predetermined length of time to allow a measured amount of oil to flow into the supply bore 72 of the manifold block 70, timing means is provided for simultaneously operating the valve members 61 at each of the lubricating units 30, 30*a* and 30*b* at the respective knitting machines 15, 15*a* and 15*b*. Referring to FIGURE 2, it will be noted that the timing means includes a valve actuating unit, broadly indicated at 115, which periodically opens the valve members 61 and a timing unit, broadly indicated at 120, which maintains the valve members 61 in open position for a predetermined length of time so that the desired amount of oil flows into the lubricating manifold block 70 before the valve members 61 are in closed position. The actuating unit 115 includes a continuously driven electric motor 121, speed reduction gears 122, a cam wheel 123 having a high cam portion 123*a* and a low cam portion 123*b* and a microswitch 124 which is actuated by the cam wheel 123.

The timing unit 120 includes a driving motor section 125, a timer reset section 126 and a switch section 127 which are schematically illustrated. The timing unit 120 is commercially available and is of the type known as a HP Series Cycl-flex Reset Timer manufactured by the Eagle Signal Corporation of Moline, Illinois. The construction and operation of the timer unit 120 is clearly shown and described in an Eagle Signal Corporation Bulletin No. 120, dated August, 1959.

The timing unit 120 is also provided with a timing dial that is graduated in seconds, a time set pointer 130 and a timer pointer 131. The time set pointer 130 may be manually set to determine the length of time that the switch section 127 will remain closed after it is actuated by the unit 115 to thereby determine the length of time that the valve members 61, associated with each of the lubricating units 30, 30*a* and 30*b*, will remain in open position to supply oil to the manifold blocks 70.

Referring to FIGURE 2, it will be noted that the actuating unit 115 and the timer unit 120 are connected to the lubricating units 30, 30*a* and 30*b* by an electrical circuit which includes a male plug 132, which may be connected to any suitable source of electrical energy, not shown. The male plug 132 has one end of a main line 133 connected thereto and the other end of which is suitably connected to one side of the driving motor 121 of the actuating unit 115. The other side of the motor 121 has one end of a wire 134 connected thereto and the other end of which is connected to one side of the motor section 125 of the timing unit 120. The other side of the motor section 125 has one end of a wire 135 connected thereto and the other end of which is suitably connected to one side of a master switch 136. The other side of the master switch 136 has one end of a wire 137 connected thereto and the other end of which is connected to the male plug 132. Thus, when the master switch 136 is closed, the motor 121 and motor section 125 are energized.

One end of a wire 140 is connected intermediate the ends of the wire 134 and its opposite end is connected to one end of the switch 124 of the actuating unit 115. One terminal at the opposite end of the switch 124 has one end of a wire 141 connected thereto and the other end of which is connected to one side of the reset section 126 of the timing unit 120. The other side of the reset section 126 has one end of a wire 142 connected thereto and the opposite end of which is connected intermediate the ends of the wire 135. Thus, when the switch 124 is engaged by the high portion 123*a* on the cam wheel 123, as shown in FIGURE 2, an electrical circuit is completed to the reset section 126 to return the timer pointer 131 to reset position.

One end of a wire 144 is connected intermediate the ends of the main line 133 and the other end thereof is connected to one side of the switch section 127 of the timing unit 120. The other side of the switch section 127 has one end of a wire 145 connected thereto and the opposite end of which is connected to one side of the electric coil 65, associated with the lubricating unit 30*b*.

One end of a wire 146 is connected intermediate the ends of the wire 135 and the opposite end thereof is connected to one side of the electric coil 65 of the lubricating unit 30*a*. The opposite side of the coil 65 associated with the lubricating unit 30*a* is connected to the medial portion of the wire 145 by a wire 147. One side of the coil 65 associated with the lubricating unit 30 is connected to the wire 145 by a wire 150 and the other side thereof is connected to the wire 146 by a wire 151. One side of the coil 65 associated with the lubricating unit 30*a* is connected to the wire 146 by a wire 152. A wire 153 connects one terminal of the switch 124 with the switch section 127 of the timer unit 120.

When the lubricating system is in operation, the motor 121 of the actuting unit 115 imparts continuous rotation of the cam wheel 123 and when the low portion 123*b* of the cam wheel 123 engages the microswitch 124, the electrical circuit to the reset section 126 is broken and the electrical circuit to the switch section 127 is completed to actuate each of the coils 65 and allow oil to flow into the bore 72 of each of the lubricating units 30, 30*a* and 30*b*. The oil continues to flow into the lubricating units until the timer pointer 130 reaches the zero position and then the electrical circuit to the lubricating unit is broken.

In the present instance, it is preferred that oil be allowed to flow into the lubricating units one time each two hours for a period of one and one-half seconds. However, it is to be understood that this timing cycle

may be varied as desired to supply the proper amount of lubricant to the knitting machines.

When the valve members **61** (FIGURE 4) associated with each of the lubricating units **30**, **30***a* and **30***b* remain open for a predetermined length of time, for example, one and one-half seconds, a predetermined amount of oil will flow into each of the bores **72** of the corresponding manifold blocks **30**, **30***a* and **30***b*. As shown in FIGURE 5, the oil will flow into each of the oil distributing pockets or chambers **95** and level itself in the bore **72**. Because the flow control elements or plugs **94** vary in length, the chambers **95** which have short plugs **94** contain more oil than the chambers **95** which have longer plugs **94**. Thus, the amount of oil which is periodically supplied to the lubricant distributing lines **80–86** varies in accordance with the lubricant requirements of the parts to which the lines **80–86** are connected.

In the present instance, the control elements **94** restrict the rate of flow of the oil into the lines **80–86** to such a degree that approximately thirty to forty-five minutes is required for all of the oil deposited in the oil distributing chambers **95** to flow through the lines **80–86** and onto the parts to be lubricated. Thus, the knitting machine is slowly lubricated over a period of approximately thirty to forty-five minutes during each two hours of operation of the machine. Also, varying amounts of oil may be distributed to the various points on the knitting machine, according to requirements of these various parts, to thereby insure sufficient but not superfluous amounts of oil being deposited on any of the parts. When any one of the knitting machines is stopped, such as for repairs, the corresponding manual valve **27** is closed to prevent the feeding of oil to the machine until the machine is returned to operation and then the valve **27** will be opened.

In the lubricating system in the present application, a single main oil reservoir supplies oil by gravity feed to each of a plurality of knitting machines. Each knitting machine is provided with a lubricator unit which operates in a periodic predetermined cycle to supply predetermined amounts of oil to various portions of the knitting machine over a prolonged period of time. It is important that the oil be distributed to the various parts of the knitting machine over some prolonged period of time, particularly when the cylinder **44** is being oiled (FIGURES 8 through 10), because if all of the oil were applied at one time, it would not be evenly distributed around the periphery of the cylinder **44**. This even distribution of the oil around the cylinder **44** insures that all of the needles N as well as the jacks SJ receive uniform amounts of oil and are properly lubricated.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. The combination of a circular knitting machine and a lubricating unit for supplying liquid lubricant to various portions of said knitting machine, said lubricating unit comprising an elongtated manifold housing having a longitudinally extending supply bore therein, the supply bore being adapted to receive liquid lubricant therein, said manifold having a vent passageway connecting the supply bore to the atmosphere, a plurality of spaced apart fittings removably secured at one end in said manifold housing, said fittings having a passageway therethrough, a lubricant distributing line connected at one end to each of said fittings, the other ends of said lubicant distributing lines extending to the various portions of said knitting machine to be lubricated, each of said fittings having a counterbore communicating with the supply bore, and a lubricant measuring and flow control element loosely positioned in the counterbore of each fitting, the length of said control element controlling the amount of lubricant deposited in the counterbore from the supply bore and the amount of clearance between the control element and the counterbore controlling the rate of flow of lubricant past said control element.

2. The combination of a circular knitting machine and a lubricating unit for periodically supplying liquid lubricant to various portions of said knitting machine, said lubricating unit comprising a lubricant distributing manifold supported at an elevation above the portions of said knitting machine to be lubricated, said manifold having a substantially horizontally disposed supply bore therein and a vent passageway connecting the supply bore to the atmosphere, intermittently operated lubricant supply means for periodically supplying a predetermined amount ol liquid lubricant to the supply bore, a plurality of lubricant distributing lines communicatively connected at their upper ends to the supply bore of said manifold, said lubricant distributing lines extending downwardly from said manifold and their lower ends being positioned to deposit lubricant on the portions of said knitting machine to be lubricated, and metering means associated with each of said lubricant distributing lines for measuring the amount and controlling the rate of flow of the lubricant passing from said supply bore in said manifold and through said lubricant distributing lines, said metering means including a plurality of outlet fittings connected at their lower ends to the upper ends of said lubricant distributing lines and removably connected at their upper ends to said manifold, the upper ends of each of said fittings having a counterbore communicating with the supply bore of said manifold and defining a lubricant distributing chamber in each of said fittings, a lubricant measuring and flow control element loosely positioned in the counterbore of each fitting, the length of said control elements being selectively varied in certain of said fittings to correspondingly vary the size of the lubricant distributing chambers therein to thereby control the amount of lubricant which is deposited in each chamber from the supply bore of said manifold, and the amount of clearance between the control elements and the counterbores in said fittings controlling the rate of flow of the lubricant from each chamber to the corresponding lubricant distributing line.

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