March 1, 1955 P. C. ROBINSON 2,703,224

PRINTING PRESS COOLING ROLL

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Fig. 1

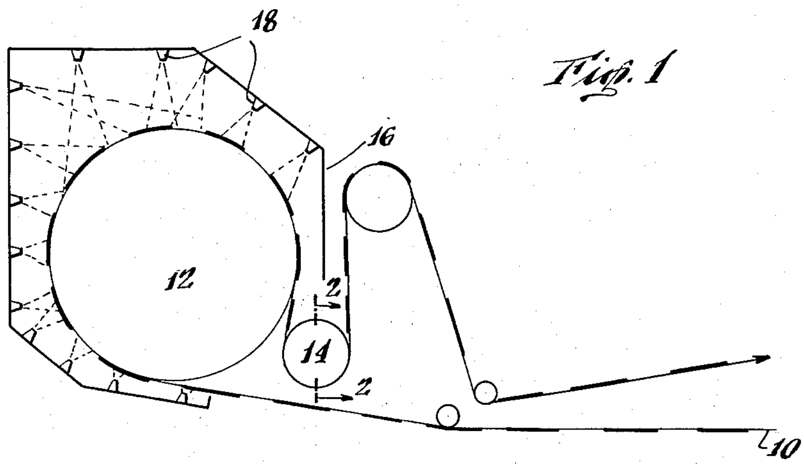


Fig. 2

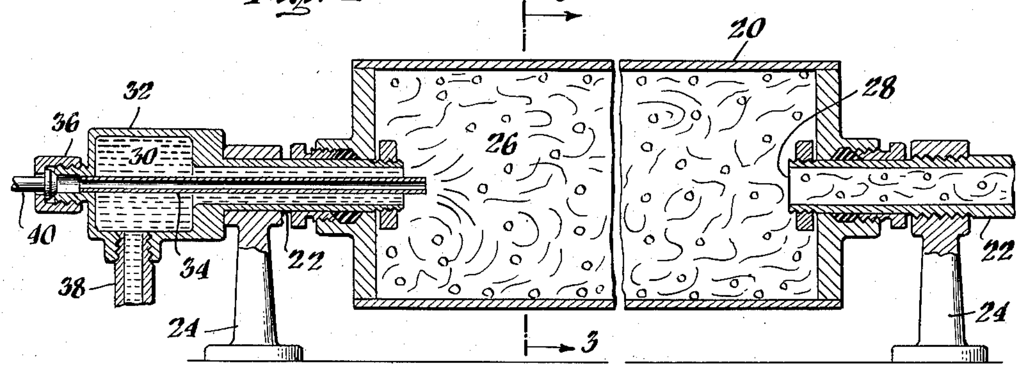
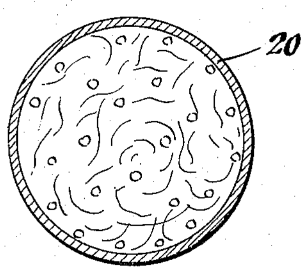


Fig. 3



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PRINTING PRESS COOLING ROLL

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2 Claims. (Cl. 257—95)

This invention relates to an improved cooling roll for a printing press and involves the use of compressed air to increase heat absorption.

In the usual continuous printing operation of the type used for printing labels and the like on non-absorbent paper, freshly printed paper is fed from the press through a dryer and then over one or more cooling rolls. These rolls usually consist of hollow cylindrical metal shells with rotary unions at each end to permit the passage of a liquid cooling medium such as water through the shell. The water absorbs heat from the roll which, in turn, cools the paper and sets the ink. After the ink is set the paper may be cut into individual sheets or rewound for storage.

Some difficulty has been experienced with modern printing equipment of this type in providing the cooling roll with sufficient heat-absorbing capacity to be integrated into a continuous printing operation. This is most important to the operation of the press because as the cooling roll heats up it is necessary to reduce press speed, thus increasing the cost of printing. The problem is particularly acute at the first roll because at normal press speed this roll quickly overheats causing ink to offset on the roll. This results in double printing and necessitates a reduction in press speed for usable copy.

In accordance with the present invention, the difficulty has been overcome and there has been produced an inexpensive and entirely satisfactory form of cooling roll. To this end in my invention I provide a continuous stream of compressed air and inject it into the cooling water at the rotary union. When this is done the surface temperature of the roll immediately drops from an estimated 200° F. to a lukewarm temperature and double printing is eliminated. Furthermore, I found that I was able to throttle back on the inlet water and still maintain satisfactory roll temperature. In fact, cooling ceased to be a limitation of press speed.

Further advantages of this invention may be readily understood by reference to the accompanying drawing in which Fig. 1 is a side elevational view of the drying end of a printing press; Fig. 2 is a longitudinal sectional view of the cooling roll taken on line **2—2** of Fig. 1 and Fig. 3 is a sectional view taken on line **3—3** of Fig. 2.

In the drawings, the numeral **10** designates a continuous sheet of freshly printed paper as it passes through the drying phase of the usual commercial printing operation of the type referred to. As shown, the paper is dried in dryer **12** and then is fed over one or more cooling rolls **14** to set the ink.

Dryer **12** is a commercial unit which may be obtained on the open market and usually consists of a hollow drum internally heated with steam to a temperature of 300° to 500° F. Embedded in drum housing **16** is a series of nozzles **18** which direct a hot blast of air against the printed side of the paper as it passes around the drum. This air blast aids the drying and carries off volatile constituents liberated from the ink. The ink is sticky as it comes from the dryer and has to be solidified before the paper can be used. Otherwise the ink smudges and the copy is spoiled.

For this purpose I provide one or more cooling rolls **14** each of which consist of a hollow cylindrical shell **20** of suitable material rotatably mounted in a pair of hollow bearings or unions **22** supported by standards **24**. Any commercial type of hollow bearing may be used but the important thing is to provide a liquid seal for the roll at the point of rotation. The rolls are driven by conventional means (not shown) so that paper **10** will travel at

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a uniform speed throughout the entire operation. A continuous flow of a liquid cooling medium, ordinarily water under pressure, is supplied from a suitable source of supply to roll inlet **26**. The water absorbs heat from the roll and carries it along through outlet **28**.

To increase the heat-absorbing capacity of the roll I inject a stream of compressed air into the entering water. This air may be injected by any suitable means. In the illustrative example shown the air is injected by means of a syphon-type rotary union **30**. This union consists of an outer chamber or pipe **32** provided with an extension which forms hollow bearing **22** for the roll. An inner pipe **34** mounted in threaded hub **36** extends into the roll through bearing **22**. The outside diameter of pipe **34** is smaller than the inside diameter of bearing **22** to allow cooling water, supplied under presusre by pipe **38**, to flow around pipe **34** and in to the roll. A compressed air line **40** is connected to inner pipe **34** by means of hub **36** and air under presusre greater than that of the water is injected into the cooling water at roll inlet **26**.

By injecting air in this way I find that the heat absorbing capacity of the roll is tremendously increased enabling me to use small, inexpensive rolls and less water. This is of particular advantage in areas where the water supply is critical.

I believe that the tremenuous increase of efficiency is caused by the turbulent flow of water in the roll. Air bubbles energized by contact with the hot shell tend to bounce away from the interface and agitate the water to produce turbulency. However, when the air is not used, apparetly a stagnant film of water collects at the interface and most of the water passes through the roll without contacting the shell. Under these conditions, little heat is carried away from the shell and overheating results.

Regardless of the exact explanation which may finally be proven for my invention, it is a fact that I get much greater heat absorption by injecting air into the cooling water. For exambple, I have found that with a maximum press speed of 400 feet per minute and a dryer temperature of 400°–500° F. the first cooling roll overheats and ink offsets on the roll. The roll is approximately 14 inches in diameter and turns at a speed of 109 revolutions per minute for a press speed of 400 feet per minute. Water is supplied to the roll through a ¾-inch pipe at a pressure of 90 pounds per square inch and at a temperature of 55° or less. This water supply is adequate for heat absorption as indicated by little if any difference in inlet and outlet water temperatures. With these conditions roll temperature approximates 200° F. and it is necessary to reduce press speed to within the range of 180 to 200 feet per minute to eliminate ink offset. However, when a stream of compressed air is injected into the cooling water, the press may be run at 400 feet per minute with a dryer temperature of 400° to 500° F. without any ink offset. The roll remains at a lukewarm temperature instead of overheating, and this enables me to cut the water pressure from 90 to 50 pounds and still maintain a satisfactory roll temperature without reducing press speed.

Although I have described my invention in connection with a cooling problem in a printing press, it will be understood that my roll may be used for any cooling problem where such rolls are customarily used.

It will be also understood that it is intended to cover all changes and modifications of the preferred embodiment of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

What I claim is:

1. A cooling roll comprising a hollow shell substantially filled with water under a pressure greater than that of the atmosphere, means for rotatively mounting the shell at each end adapted to form a liquid tight seal at the ends of the shell, means associated with said mounting means positioned at one end of the center of the shell for passing a stream of water into the shell along the axis thereof at a pressure greater than that of the atmosphere and means associated with said water injecting means for injecting a stream of compressed air into

the entering pressurized water along the axis of the shell and concentrically with said stream of water to form a single stream of cooling fluid comprising an intimate mixture of two fluids having different rates of thermal expansion whereby internal conditions of flow are established in the mixture between the two fluids caused by their different rates of expansion which occurs when the fluids are heated at the surface of the shell and which prevents equilibrium conditions and a stagnant layer of fluid from collecting at the surface of the shell.

2. A cooling roll comprising a hollow cylindrical shell substantially filled with water under a pressure greater than that of the atmosphere, said shell being rotatively mounted at one end with a syphon type rotary union and at the other end with a hollow bearing, said union and bearing being adapted to form a liquid tight seal at either end of said shell, said union including a pipe positioned at one end of the center of the shell on line with the axis thereof for passing a stream of water into the shell along its axis at a pressure greater than that of the atmosphere, a second pipe associated with said union positioned on line with the axis of the shell and arranged concentrically

with said first mentioned pipe for injecting a stream of compressed air into the shell along the axis thereof concentrically with said stream of water to form a stream of cooling fluid comprising an intimate mixture of two fluids having different rates of thermal expansion whereby internal conditions of flow are established in the mixture between the two fluids caused by their different rates of expansion when heated at the surface of the shell to prevent equilibrium conditions and a stagnant layer of fluid from collecting at the surface of the shell.

References Cited in the file of this patent

UNITED STATES PATENTS

685,823	Cowin	Nov. 5, 1901
1,564,171	Brown	Dec. 1, 1925
1,820,074	Kilborn	Aug. 25, 1931
1,851,077	Arck	Mar. 29, 1932
1,886,302	Pond	Nov. 1, 1932
1,892,028	Alderfer	Dec. 27, 1932
2,564,745	Wintermyer	Aug. 21, 1951
2,605,084	Reents et al.	July 29, 1952