July 5, 1955 C. O. BRUESTLE 2,712,381

WATER COOLED WIRE DRAWING BLOCK

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Fig. 1.

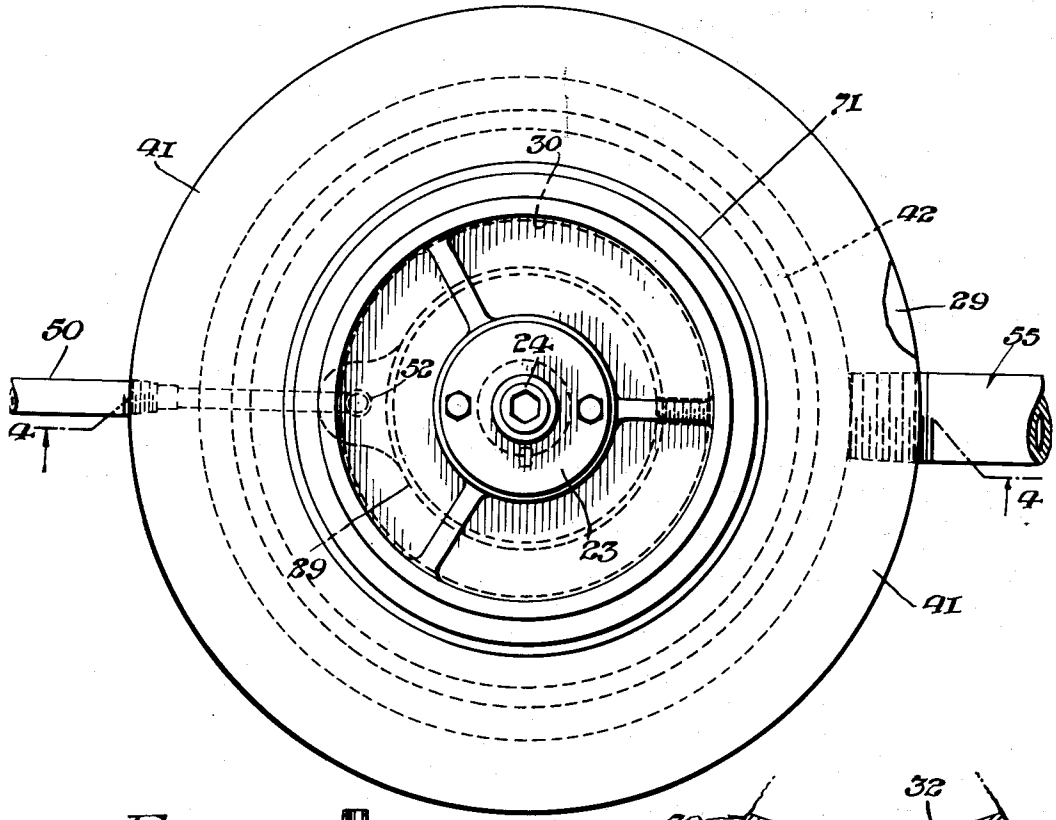
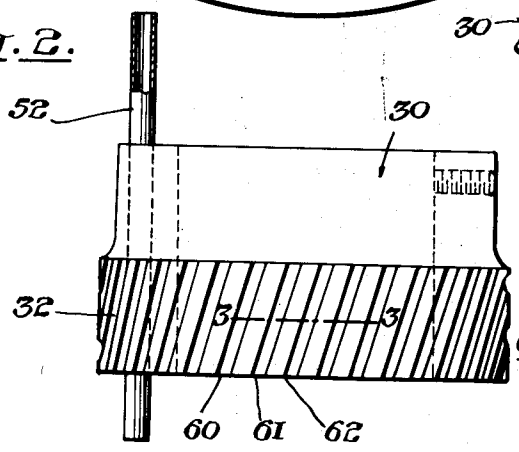


Fig. 2.



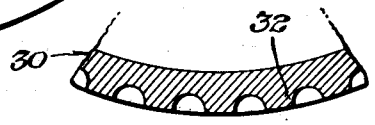


Fig. 3.

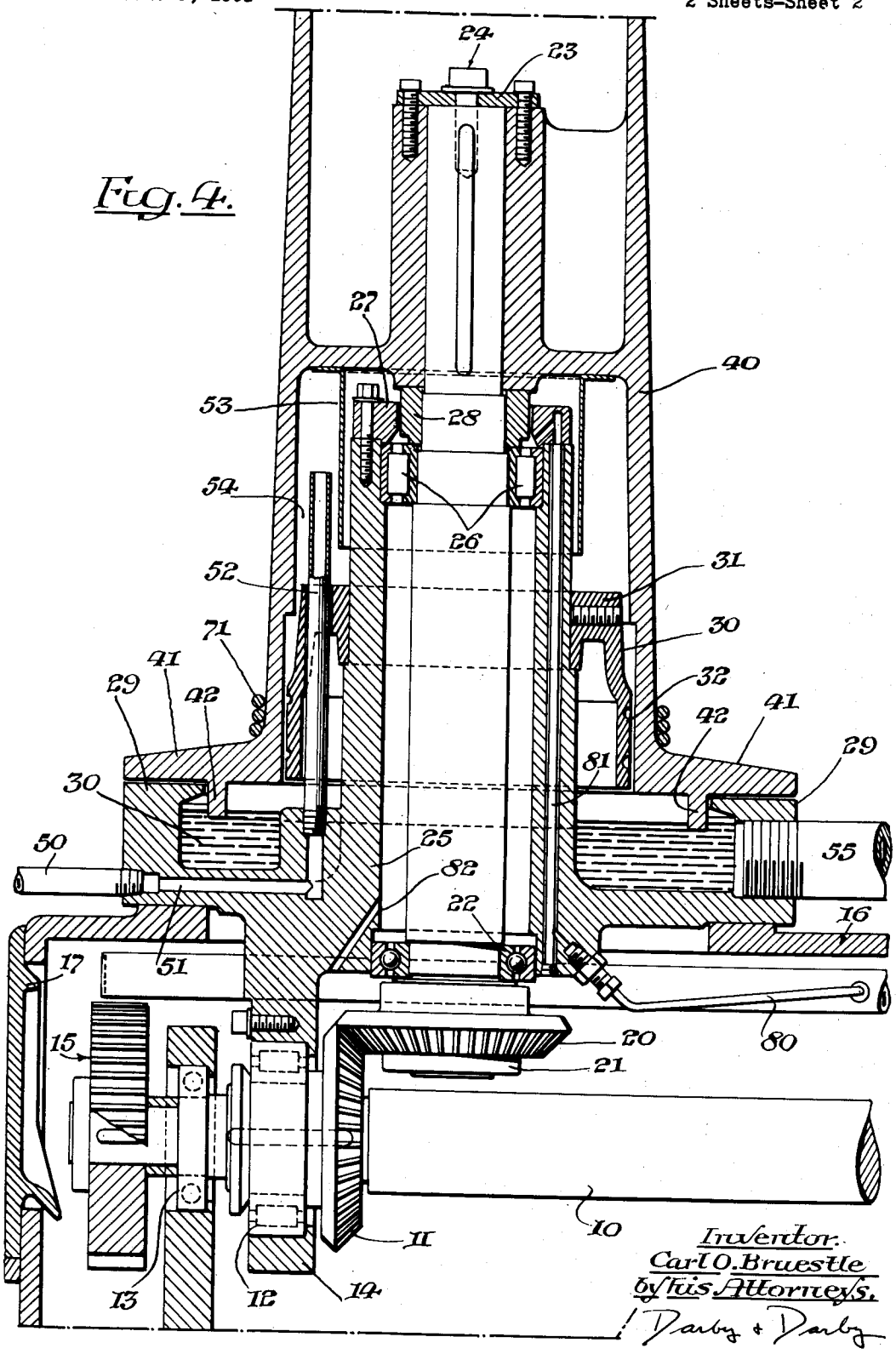
Inventor:
Carl O. Bruestle
by his Attorneys,
Darby & Darby

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Fig. 4.



Inventor.
Carl O. Bruestle
by his Attorneys.
Darby & Darby

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WATER COOLED WIRE DRAWING BLOCK

Carl O. Bruestle, Metuchen, N. J., assignor to Syncro Machine Company, Perth Amboy, N. J., a corporation of New Jersey

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4 Claims. (Cl. 205—20)

This invention relates to a water cooled wire block for use in wire drawing machines and particularly to a water cooled coiler block which provides for directing a film of cooling fluid onto the inner surface of the core of the block on which the wire is wound.

In the art of wire drawing and coiling products many devices of this character have been employed which involve one cooling means or another, and principally revolve about playing a water jet against the inner surface of the block. Though such devices are of greater or lesser degrees of effectiveness, they are based on the theory of moving a large mass of water past the surface to be cooled in order to accomplish the desired objective. In contrast thereto, and recognizing that where heat transfer is taking place from a solid surface to a liquid, the principal barrier to effective flow of heat is in a thin film of liquid adjacent to the surface, applicant has as the first object of his invention the provision of an apparatus in which the cooling of the wire block from the interior thereof is done by directing a moving film of water against the surface to be cooled.

Another object of the invention is to provide a water cooled coiler block wherein the thinnest portion of the cooling water film is applied to the inside against that surface subjected to the highest degree of heating.

It is another object of the invention to provide a water cooled coiler block structure in which the passage of water in a thin film is most rapid past the surface subjected to the highest degree of heat.

Other objects and advantages of the invention will in part be obvious and in part appear hereinafter.

The invention accordingly is embodied in a coil block structure for a wire drawing machine, which, in characteristic fashion, has a tapered conical core, the broadest portion of the taper being adjacent the end flange to which the wire is fed to be sprung upward as the core is rotated about a vertical axis, the coiler block being characterized by an internal structure providing for mounting the block on a shaft held in a vertical position, the core being hollow and containing baffles for directing and maintaining a cooling fluid film between a vertical baffle and the inner surface of the core, the fluid being fed to a pool maintained under the block from which the cooling fluid finds its way to an exit or drain pipe. The invention thus is embodied in a water cooled block having the features of construction, combinations of elements and arrangement of parts hereinafter to be described in greater detail.

In the drawings:

Figure 1 represents a plan view of the block showing the general conical structure thereof and the relative location of the cooling fluid inlet and outlet;

Figure 2 is a side elevation of the inner stationary baffle which in the device is aligned with the lower portion of the core of the coiler block, the baffle having grooves thereon for forcing the cooling fluid film off the inner surface of the core and down into the reservoir;

Figure 3 is a section taken along the line 3—3 of Figure 2; and

Figure 4 is a detailed sectional view of the coiler block taken along the line 4—4 of Figure 1.

Referring specifically to Figure 4, there is shown drive shaft **10**, carrying bevel gear **11**, the shaft being mounted in bearings **12** and **13** affixed to the machine base **14**. Conventionally, the driving mechanism is housed in the base unit **16**, which has the closure **17** at one end thereof to provide access to the several parts. The driving portion is substantially conventional.

Meshing with the bevel gear **11** is the mating bevel gear **20**, connected to shaft **21** which is carried in bearings **22**, the shaft continuing on to practically the full height of a coil block and terminating in flange **23** and closure bolts **24** for holding a particular block in place. The shaft is also held in accurate vertical alignment with the internal supporting structure **25**, which is mounted on the base of the machine, by means of bearings **26** and cap **27**, which constitutes a collar fastened to support **25** in which space **28** is aligned. The support **25** is stationary and forms a fixed part of the machine bed **16** and, in the instant structure, is formed with the lower circumference thereof turned outwardly and upwardly, as at **29**, to define an inner chamber **30**, which is a circumferential chamber serving as a reservoir in the base of the block.

Mounted on the vertical support **25** and held in fixed relationship therewith, is the baffle unit **31**, which has the inner opening thereof reentrant and matched to the diameter of the vertical support **25** and held in fixed position thereon by a set screw. The form of the baffle is such that it defines a downwardly depending skirt **32**, which terminates at about the upper level of the circumferential chamber **30**. Coiler block **40** fits over shaft **21** and at its base is flanged outwardly as at **41** to define a cover for the chamber **30**. It will be observed that a small clearance is left between the flange **41** and the upwardly turned edges **29**. Formed on the underside of the cover **41**, is the downwardly depending flange or skirt **42**, having an outer circumference substantially matching the inner circumference of the upwardly turned edges **29** so that it travels in that opening and reaches down toward the level of fluid in the reservoir.

An inlet conduit **50** for cooling liquid is threaded into an appropriately tapped inlet **51** in the base member **25**, the conduit leading to a vertical standpipe **52**, which extends to a height well up into the core of the coil block. The terminus of the standpipe **52** is placed at a level above the lower end of the skirt **53**, mounted on the coil block itself. The standpipe **52** also passes up through the skirt **31**.

Details of construction of the skirt **31** are shown in Figure 2, where it appears that the lower portion **32** carries grooves **60**, **61**, **62**, etc., which are inclined, for example, as elements of helixes to aid in causing the cooling liquid to flow through the block.

As indicated, the basic theory of the operation of the coil block is to provide the most effective possible cooling at that portion of the block receiving the heaviest heat load from the wire drawn and coiled thereon. In normal operation, wire **70** is fed onto the coil block as indicated in Figure 4 and is hottest at the point where it first meets said block. As the wire cools the taper of the core and the additional wire being fed thereon at the point **71** causes the coil to travel upward, and ultimately it is removed from the block.

It is apparent then that the greatest heat load is carried by the block at about the point **71** and in that general area. Accordingly, provision is made to have a relatively rapidly moving thin film of water playing past the inner surface of the core at that area, which is accomplished by reducing the clearance between the inside diameter

of the block and the skirt 31 to the minimum practicable extent and by providing the grooves on the skirt 31, so as to encourage the sweeping of the water past that area.

Thus, in operation, the block will be operated at its conventional rate of speed and take up wire. Cooling liquid, for example, water, will be fed into the conduit 50 to be discharged from the standpipe 52 at a level slightly above the bottom of the skirt 53. The rate of feed of water is sufficient to cause wetting of the skirt and maintenance of a level of water at about 54 in that portion of the chamber. This water is then fed downward through the small annulus formed by the core and the skirt 31 until it reaches the smaller annulus defined by the end 32 of the skirt, and the core and is finally discharged into the chamber 30. It builds up only slightly in chamber 30 for the size of discharge pipe 55 is made such that an overflow does not occur.

The internal structure of the shaft is essentially conventional and the lubricating system provided therefor includes conduit 80 which feeds oil into the channel 81 which in turn passes oil to the bearing 26, which oil finds its way out through conduit 82.

Having described the invention with only a single embodiment thereof, it will be apparent that the fundamental principle is the maintenance of the film of liquid adjacent the greatest heat load of the apparatus, and the invention can be practiced with variations of the single structure shown herein without departing from the spirit or scope thereof.

What is claimed is:

1. In a wire drawing apparatus a coiler block rotatable about a vertical axis, said block having a core about which wire is coiled, said core having a smooth interior wall, a support for said block having a circumferential recess therein below said block for receiving a pool of cooling liquid from the block, a conduit feeding cooling liquid through said support up into the core of the block, a stationary baffle unit within the core of said block, a narrow annular passage formed by said baffle and said smooth interior wall of said core guiding said cooling liquid over the inner surface of the block as a thin film and discharging the cooling liquid directly into said circumferential recess.

2. In a wire drawing apparatus, a coiler block rotatable about a vertical axis, said block having a section about which wire is coiled, said block having a smooth interior wall in said section, a support beneath the block enclosing a reservoir structure to receive cooling liquid, conduit to direct cooling liquid upward into the core of the block, a stationary baffle means in said core to direct cooling liquid down against the inside wall of said block, said baffle means being fixed on the machine in relation to the shaft of the coiler block and concentric with said coiler block, said block and baffle defining a narrow annular passage for cooling liquid to pass downward into said reservoir.

3. In the structure in accordance with claim 2, the baffle means defining said annulus having grooves formed therein to prevent the cooling water from adhering to the interior walls of the block.

4. In the structure in accordance with claim 2, the baffle means defining said annulus having grooves formed in the outer wall thereof, said grooves being substantially parallel to the axis of the coiler block, said grooves presenting sharp edges which prevent the cooling water from adhering to the interior walls of the block.

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