Sept. 16, 1947. W. D. KELLOGG 2,427,395

WARP KNITTING MACHINE

Filed Aug. 22, 1946 2 Sheets-Sheet 1

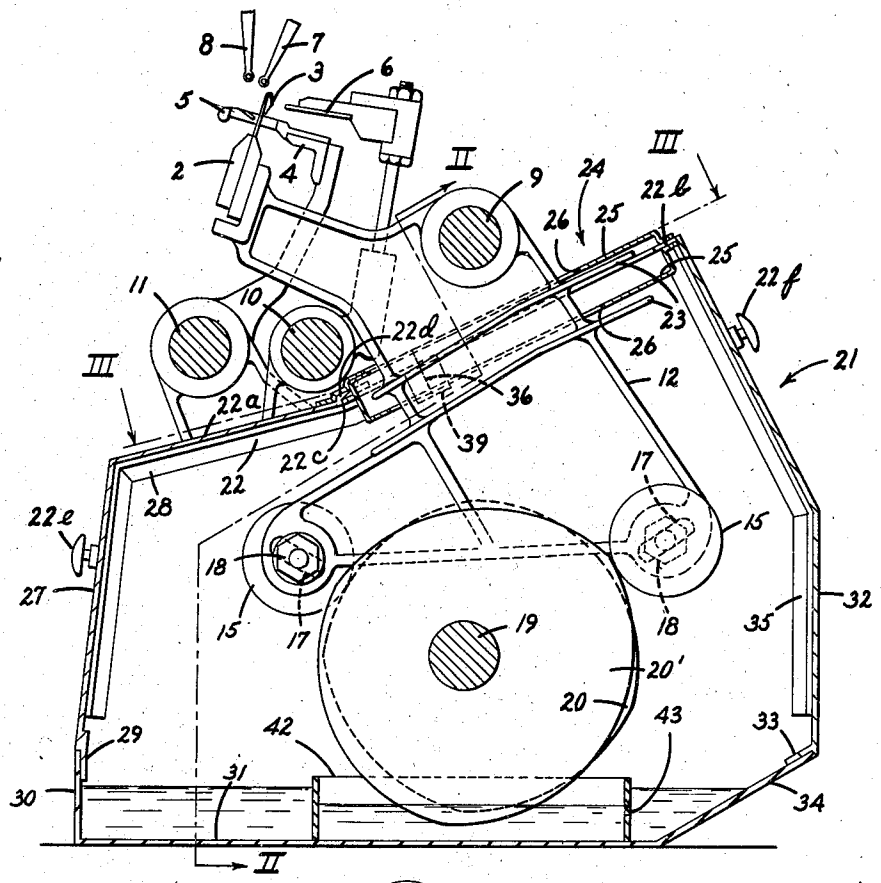

Fig. 1

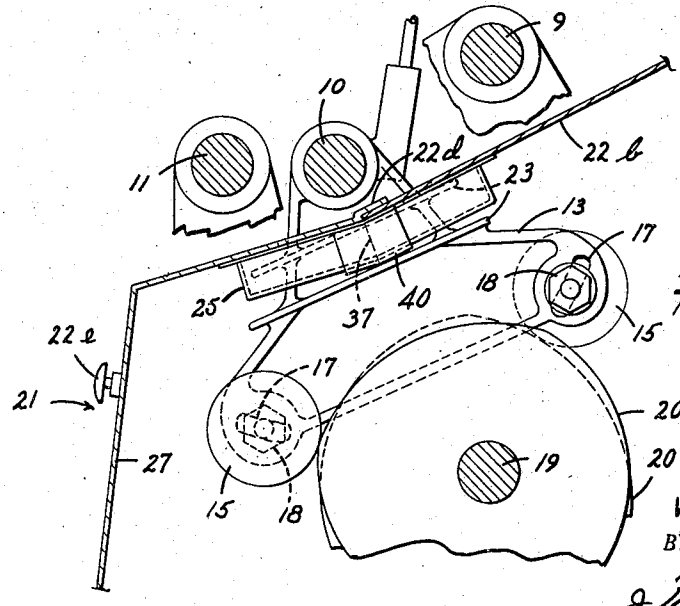

Fig. 5

INVENTOR.
WILLIAM D. KELLOGG
BY
Thomas R. O'Malley

Sept. 16, 1947. W. D. KELLOGG 2,427,395

WARP KNITTING MACHINE

Filed Aug. 22, 1946 2 Sheets-Sheet 2

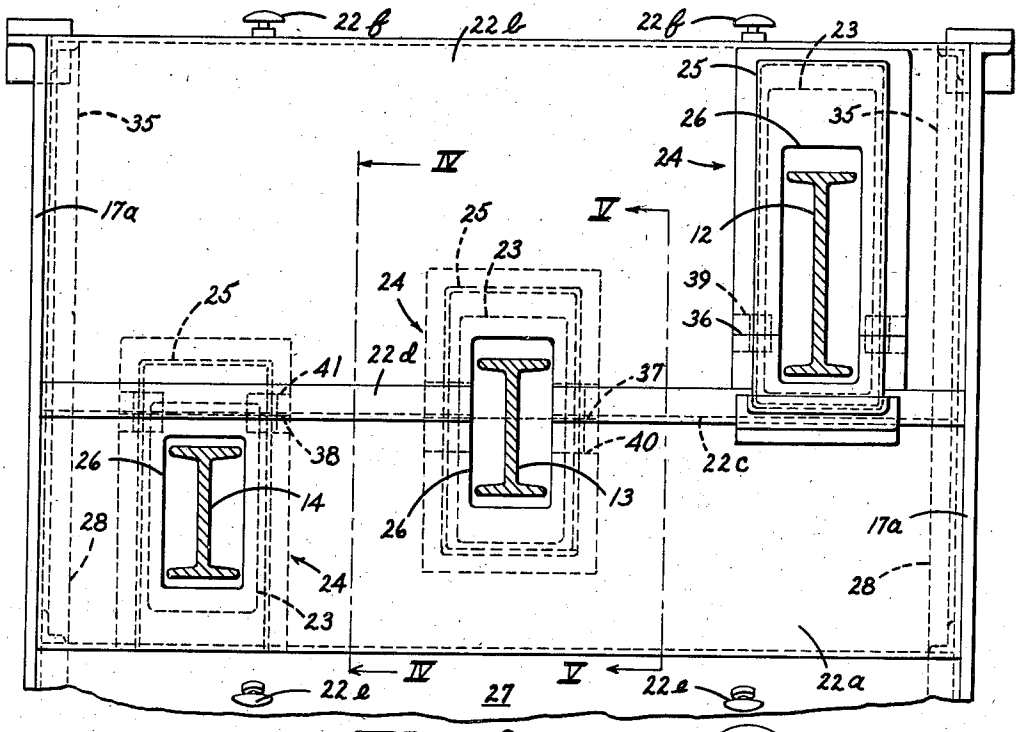

Fig-3

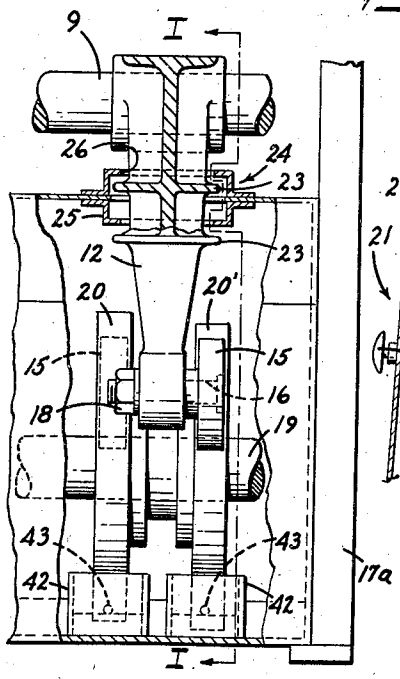

Fig-2

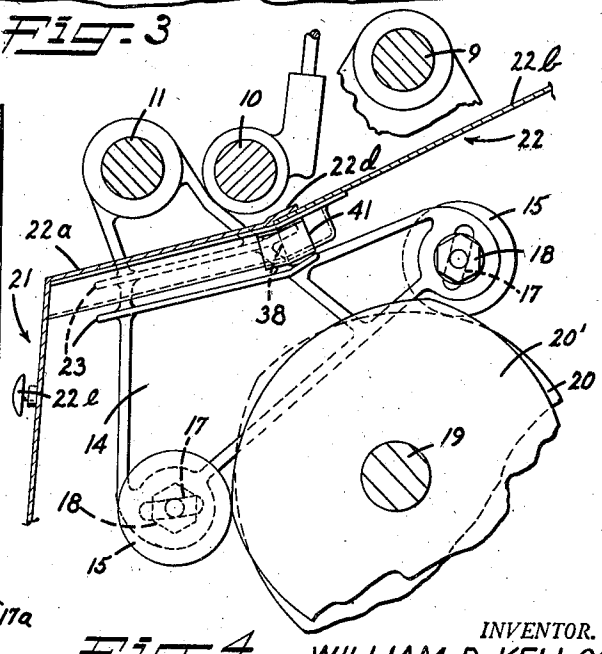

Fig-4

INVENTOR.
WILLIAM D. KELLOGG
BY
Thomas R. O'Malley

Patented Sept. 16, 1947 2,427,395

UNITED STATES PATENT OFFICE

2,427,395

WARP KNITTING MACHINE

William D. Kellogg, Amsterdam, N. Y., assignor to Aveco, Incorporated, Amsterdam, N. Y., a corporation of New York

Application August 22, 1946, Serial No. 692,221

11 Claims. (Cl. 66—86)

1

This invention relates to a warp knitting machine comprising knitting elements including needles, guides, sinkers, presser bars and the like, and a cam shaft carrying cams which engage cam followers for controlling the knitting cycle of the elements.

In this type of warp knitting machine, it is virtually impossible to adjust the followers to that they engage the cam surfaces without play. Generally, it is the practice to provide for each movement (that is, for example, for the movement of the needle bar) a plurality of cams spaced along the cam shaft, a plurality of countercams one adjacent each cam and followers for each cam and countercam set, each pair of followers being carried by a single lever mounted pivotally for transferring the motion to the particular bar carrying the knitting elements, such as the needle bar, guide bar, sinker bar, or presser bar. When it is desired to adjust the operation of the knitting elements, such as the operation of the needle bar, it is customary to effect the adjustment by moving the cam follower roller carried by the lever in a slot therein closer or farther from the cam and then taking up the slack by moving the other follower roller against the countercam. The impossibility of maintaining a complete absence of play between the several cams and followers results in excessive wear and vibration, particularly when it is desired to operate the machine at high speed, since the levers are given an oscillatory or rocking movement by the cams and a blow or shock is transmitted between them at every reversal of the direction of such movement.

In accordance with the present invention, the cam shaft is substantially enclosed within a housing containing a viscous liquid into which the cams dip or in which they run at least partially immersed so that their peripheries are supplied with a film of the liquid. This liquid should preferably be stable and non-corrosive and have a viscosity of at least about S. A. E. 10. The viscous film between the cam surface and the follower occupies any clearance or play and exerts a cushioning effect between the cam and follower surfaces thereby greatly reducing the vibration and wear. The levers extend through suitable openings in the housing and are provided with laterally projecting baffles which are of greater area than the openings and are spaced inwardly from the openings in general alignment therewith. A preferred embodiment involves means for controlling the supply of liquid to each cam. Another preferred construction has a plurality of baffles on each lever co-operating with a plurality

2

of spaced wall panels through openings in which the lever extends.

The drawing is illustrative of preferred embodiments of the invention and—

Figure 1 is a transverse section, with parts broken away, of a warp knitting machine embodying the invention taken on line I—I of Figure 2,

Figure 2 is a front elevation with parts in section and parts broken away, along a portion of the length of the machine,

Figure 3 is a transverse cross-section on line III—III of Figure 1,

Figure 4 is a transverse cross-section on line IV—IV of Figure 3, and

Figure 5 is a transverse cross-section on line V—V of Figure 3.

As shown in Figure 1, the knitting machine comprises a needle bar 2 carrying needles 3, a sinker bar 4 carrying sinkers 5, a presser bar 6, and two or more guide bars (not shown) carrying guides 7 and 8. The needle bar, presser bar, and sinker bar are pivotally mounted on shafts 9, 10 and 11 respectively. The guide bars are similarly mounted but to clarify the illustration and to make it as simple as possible, the mounting of the guide bars is not shown, since they are in all respects similar to the mountings of the needle bar, presser bar and sinker bar. The needle bar, presser bar, sinker bar, etc., are rocked pivotally upon their shafts 9, 10, 11, etc., by means of the levers 12, 13 and 14 (see Figs. 2 to 4) whose lower ends carry laterally offset roller followers 15. These roller followers are carried on stud shafts 16 (Fig. 2) mounted in slots 17 (Figures 1, 4 and 5 formed in the ends of the levers 12, 13, and 14 to permit adjustment by means of nuts 18 in conventional manner.

A cam shaft 19 is mounted in suitable bearings in the upright frame members 17a and carries a plurality of pairs of cams 20 and countercams 20' for engagement with the roller followers 15 carried by the levers 12, 13, 14, etc. Additional cams which are not shown are provided for controlling the guide bars and optionally the tension bars.

In accordance with the present invention, a housing 21 is provided about the cam shaft 19. This housing is adapted to receive a viscous liquid at a sufficient level so that the cams are at least partially immersed. The immersion may be sufficient to cause the cams to run constantly through the liquid, or it may be somewhat less (as shown) to assure that the cams dip into the liquid at least part of the time of each revolution.

Each of the levers 12, 13, 14, etc., extends through one of a plurality of passage means 24 comprising openings provided in the upper wall 22 of the housing 21. Each of the levers is provided with one or more laterally projecting baffles 23. If one baffle is employed it is spaced inwardly of the opening in the upper wall 22 through which the lever extends. Each baffle has a greater area than the area of the opening inside of which it is positioned and the baffle is generally in alignment with the opening so that at all times during the cycle of movement of the lever the baffle overlaps or blocks the entire opening, thereby preventing any direct passage of the liquid outward through the opening.

A preferred construction has a composite passage means 24 (see Figure 1) carried by the upper wall 22 of the housing 21. As shown, this composite door has a plurality of spaced panels 25 each provided with a generally aligned opening 26 through which one of the levers extends. The panels 25 are spaced apart so that they may alternate with the baffles 23 upon the lever, each baffle being disposed inside of the corresponding opening and having a greater area than such opening. The innermost baffle 23 deflects the liquid thrown upwardly from the cams 20 and 20' from the innermost opening 26 and each subsequent baffle and associated opening serves as additional protection against the loss of any spray, splash or mist coming from the cams immediately there below or those offset laterally therefrom.

The baffles 23 may take various forms for the various levers as may be seen from a comparison of that shown in Figure 1 with those shown in Figures 4 and 5. The construction depends upon the amount of oscillatory movement imparted to the levers and the arrangement of the parts with respect thereto, particularly the disposition of the rock shafts 9, 10, 11, etc., relative to the upper wall 22 of the housing.

To facilitate dismantling and reassembly of the housing and levers, the upper wall of the housing 21 is formed of two sections in the form of plates 22*a* and 22*b* and their line of juncture at 22*c* extending generally longitudinally of the machine is overlapped by means of a strip 22*d* secured to or formed integrally with the upper edge of member 22*a*. The member 22*a* may be formed integrally with the front wall 27 of the housing and the unit formed of member 22*a* and front wall 27 may rest upon angle irons 28 secured on adjacent upright frame members 17*a*. The lower edge of wall 27 may be provided with a downwardly extending strip 29 adapted to overlap an upright wall 30 extending from the floor 31 of the housing. Similarly, plate 22*b* may be formed integrally with the back wall 32 which may be bent as shown and has adjacent its lower end a strip 33 adapted to fit within the sloped wall 34 extending from the back of the floor 31 of the housing. Angle irons 35 may be arranged upon the adjacent uprights 17*a* for carrying the member 22*b* and the back wall 32.

Each passage means 24 is divided transversely into two sections as at lines 36 (Figure 1), 37 (Figure 5) and 38 (Figure 4). This break (36, 37, or 38) extends completely through the passage means and both openings therein and joins the line of juncture 22*c* so that when member 22*a* is separated from member 22*b* of the housing, which may be accomplished with the aid of handles 22*e* and 22*f* respectively, merely by a combined lifting and outward motion of either the

back or front sections, one section of the passage means 24 is carried with 22*a* and the other section is carried with 22*b*. To seal this juncture between the two sections of the passage means 24, a skirt, such as 39 in Figure 1, 40 in Figure 5, and 41 in Figure 4, is secured to one of the sections and overlaps the juncture thereof with the other section. These skirts, wherever they overlap openings 26, are cut away to be flush with such openings so that they do not interfere with the operation of the levers therein.

In the preferred construction, each cam 20 and each cam 20' is provided with an individual receptacle 42, though such receptacles may be omitted if desired. Such receptacles 42 are open at the top and extend to a point above the genera level of liquid within the housing and are provided with small orifices 43 which are of predetermined bore and height to provide a desired level within the receptacles 42. This arrangement controls the amount of liquid in direct contact with each individual cam and thereby limits the splashing while assuring that each cam is provided with a proper film of liquid on its periphery. This control reduces the amount of work consumed in agitating the liquid, reduces splash, spray and mist and thereby increases the efficiency of the operation. An excessive amount of oil carried by the peripheries of the cams serves no useful purpose and is preferably avoided. As will be seen from the drawings, the cams dip into the viscous liquid and carry a film thereof into engagement with the roller followers, thereby eliminating to a large extent undesirable vibration and wear and allowing higher speeds to be attained. The construction is such that the liquid is effectively prevented from migration to parts outside the housing and no soiling of the materials being fabricated occurs.

Any suitable liquid having sufficient stability, viscosity and non-corrosiveness may be supplied to the housing 21 which preferably is made of sufficient length to supply all of the cams between adjacent upright frame members 17*a* of the machine. In case the machine has great length for producing broad fabrics, a plurality of upright frame members 17*a* may be present and a separate housing may be provided between each adjacent two of such upright members. If desired, however, the housing may communicate with the housing on the other side of such a frame member. Again, each set of cams (that is, an associated cam and countercam) may be provided with a separate housing.

Numerous liquids of stable, viscous, non-corrosive character may be used in the machine, provided they have a viscosity of at least about S. A. E. 10. Examples are the liquid Silicones produced by the condensation of silica with alkylene halides. Hydrocarbons and their condensation products having the desired viscosity, stability and non-corrosiveness are also suitable. These hydrocarbons may include the paraffins, the naphthenes and the aromatics.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft

for containing a stable, viscous, non-corrosive liquid, a cam on the shaft arranged to dip into the liquid, passage means through an upper wall of the housing comprising an opening, a pivotally mounted lever extending through the passage, and cam follower means carried by the lever and engaging the cam through a viscous film of the liquid lifted by the rotation of the cam to the position of engagement with the follower means.

2. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, a cam on the shaft arranged to dip into the liquid, passage means through an upper wall of the housing comprising an opening, a pivotally mounted lever for actuating one of the knitting elements extending through the passage and having a cross-sectional area in the plane of the passage sufficiently small relative to the area of the passage to allow rocking of the lever by the cam without engaging the edge of the wall surrounding the passage, and cam follower means carried by the lever and engaging the cam through a viscous film of the liquid lifted by the rotation of the cam to the position of engagement with the follower means.

3. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, a cam on the shaft arranged to dip into the liquid, passage means through an upper wall of the housing comprising an opening, a pivotally mounted lever for actuating one of the knitting elements extending freely through the opening, laterally projecting baffle means carried by the lever and spaced inwardly from the opening, said baffle means facing the opening and being of greater transverse area than the opening, and cam follower means carried by the lever and engaging the cam through a viscous film of the liquid lifted by the rotation of the cam to the position of engagement with the follower means.

4. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, a cam on the shaft arranged to dip into the liquid, passage means through an upper wall of the housing comprising two spaced panels having generally aligned openings therein, a pivotally mounted lever for actuating one of the knitting elements and extending freely through the openings, laterally projecting baffles carried by the lever, each of said baffles being spaced inwardly of a corresponding one of the openings in general alignment therewith and having a greater transverse area than its corresponding opening, and cam follower means engaging the cam through a viscous film of the liquid lifted by the rotation of the cam to the position of engagement with the follower means.

5. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid,

cams on the shaft arranged to dip into the liquid, a plurality of passage means through an upper wall of the housing each comprising at least one panel having an opening therein, pivotally mounted levers extending through the openings in the passage means, laterally projecting baffle means carried by each lever and spaced inwardly from the respective openings associated with their levers, each of said baffle means facing its respective opening and being of greater transverse area than said opening, and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means.

6. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft arranged to dip into the liquid, a plurality of passage means through an upper wall of the housing each comprising two spaced panels having generally aligned openings therein, pivotally mounted levers each extending through the openings in one of the passage means, laterally projecting baffles carried by each lever, each of said baffles being spaced inwardly from a corresponding one of the openings in general alignment therewith and having a greater transverse area than its corresponding opening and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means.

7. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft arranged to dip into the liquid, a plurality of passage means through an upper wall of the housing each comprising at least one panel having an opening therein, pivotally mounted levers extending through the openings in the passage means, laterally projecting baffle means carried by each lever and spaced inwardly from the respective openings associated with their levers, each of said baffle means facing its respective opening and being of greater transverse area than said opening, and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means, said upper wall of the housing being divided into two separable sections along a line of juncture extending generally in the longitudinal direction of the machine, said line of juncture extending across all of the openings of said passage means, thereby dividing each of the passage means into two sections, one carried by each section of the upper wall of the housing.

8. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft arranged to dip into the liquid, a plurality of passage means through an upper wall of the housing each comprising two spaced panels having generally aligned openings therein, pivotally mounted levers each ex-

tending through the openings in one of the passage means, laterally projecting baffles carried by each lever, each of said baffles being spaced inwardly from a corresponding one of the openings in general alignment therewith and having a greater transverse area than its corresponding opening and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means, said upper wall of the housing being divided into two separable sections along a line of juncture extending generally in the longitudinal direction of the machine, said line of juncture extending across all of the openings of said passage means, thereby dividing each of the passage means into two sections, one carried by each section of the upper wall of the housing.

9. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft, open receptacles within the housing, one under each of the cams and having walls extending above the level of liquid in the housing, means for controllably permitting flow of liquid from the housing into each receptacle, and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means.

10. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft, open receptacles within the housing, one under each of the cams and having walls extending above the level of liquid in the housing, means for controllably permitting flow of liquid from the housing into each receptacle, passage means through an upper wall of the housing comprising an opening, a pivotally mounted lever for actuating one of the knitting

elements extending freely through the opening, laterally projecting baffle means carried by the lever and spaced inwardly from the opening, said baffle means facing the opening and being of greater transverse area than the opening, and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means.

11. In a warp knitting machine, knitting elements, a cam shaft for controlling the knitting cycle of the elements, means for rotating the cam shaft, a substantially closed housing about at least a portion of the length of the cam shaft for containing a stable, viscous, non-corrosive liquid, cams on the shaft, open receptacles within the housing, one under each of the cams and having walls extending above the level of liquid in the housing, means comprising an orifice in the receptacle wall for controllably permitting flow of liquid from the housing into each receptacle, passage means through an upper wall of the housing comprising an opening, a pivotally mounted lever for actuating one of the knitting elements extending freely through the opening, laterally projecting baffle means carried by the lever and spaced inwardly from the opening, said baffle means facing the opening and being of greater transverse area than the opening, and cam follower means engaging the cams through a viscous film of the liquid lifted by the rotation of the cams to the position of engagement with the follower means.

WILLIAM D. KELLOGG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,981,511	Kinsella et al.	Nov. 20, 1934
2,317,186	Fowler	Apr. 20, 1943

FOREIGN PATENTS

Number	Country	Date
627,392	Germany	Mar. 14, 1936