Feb. 17, 1942. P. TUCHSCHERER ET AL 2,273,301

FLAT KNITTING MACHINE

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Fig. 1

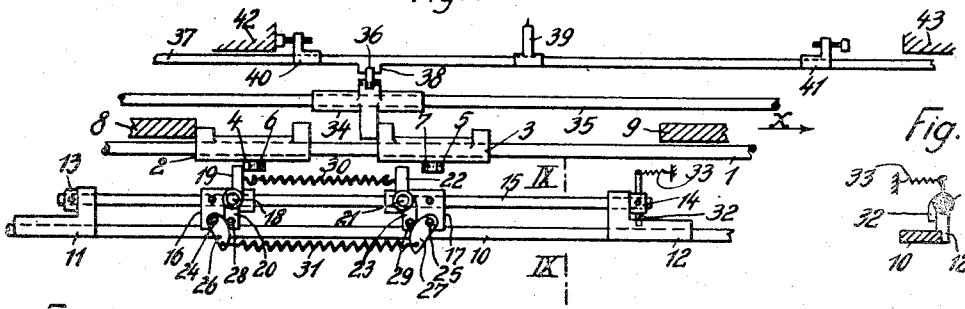


Fig. 9

Fig. 10

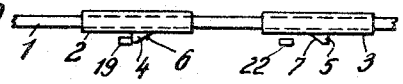


Fig. 2

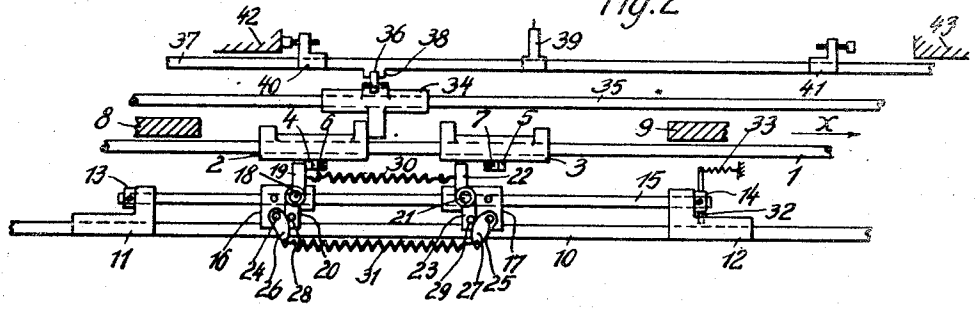


Fig. 3

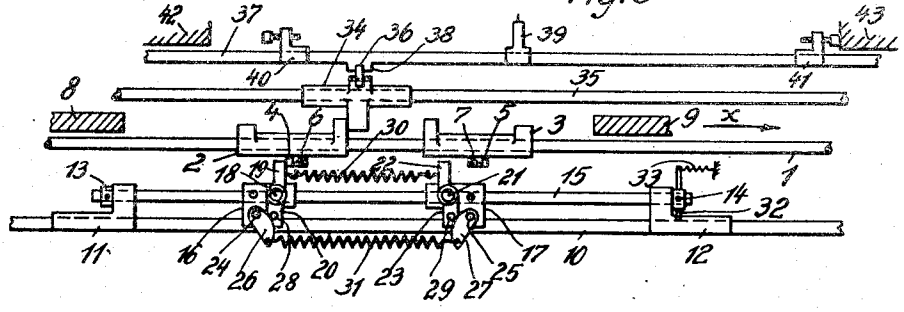
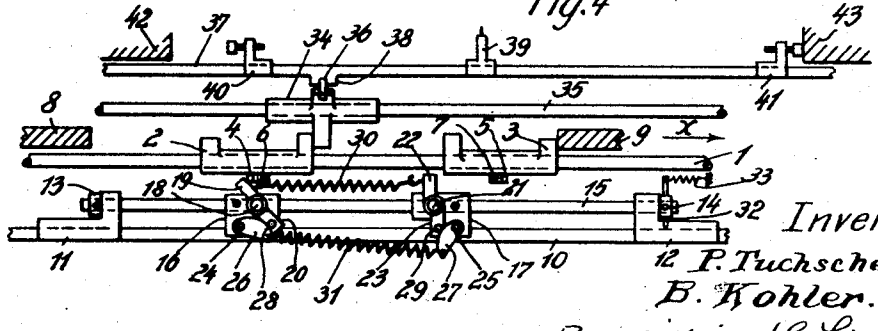


Fig. 4



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FLAT KNITTING MACHINE

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Fig. 5

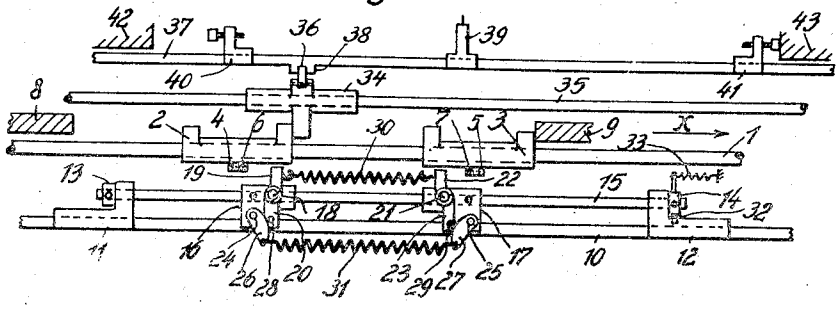


Fig. 6

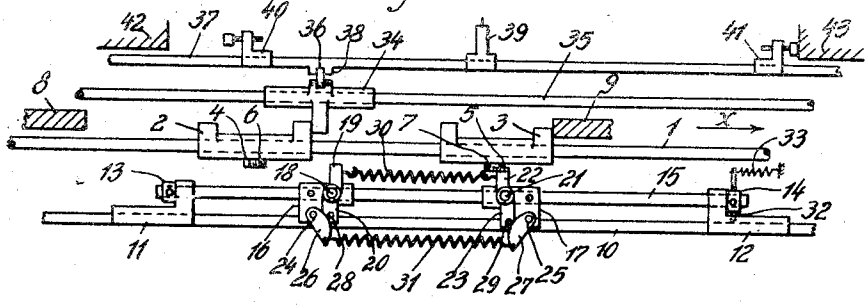


Fig. 7

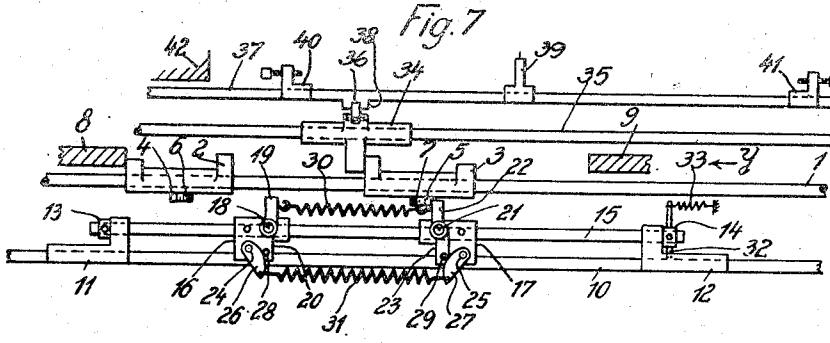
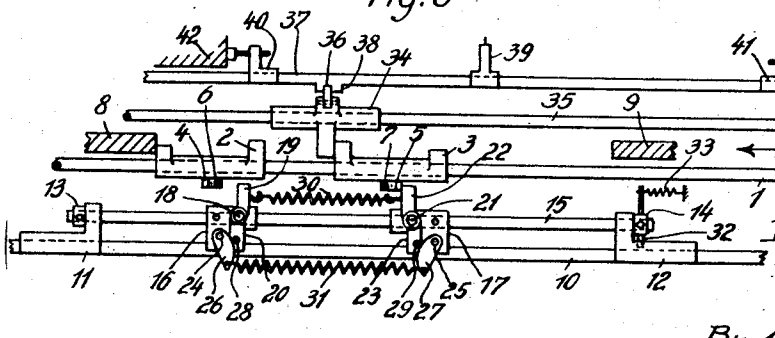


Fig. 8



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FLAT KNITTING MACHINE

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Fig. 11

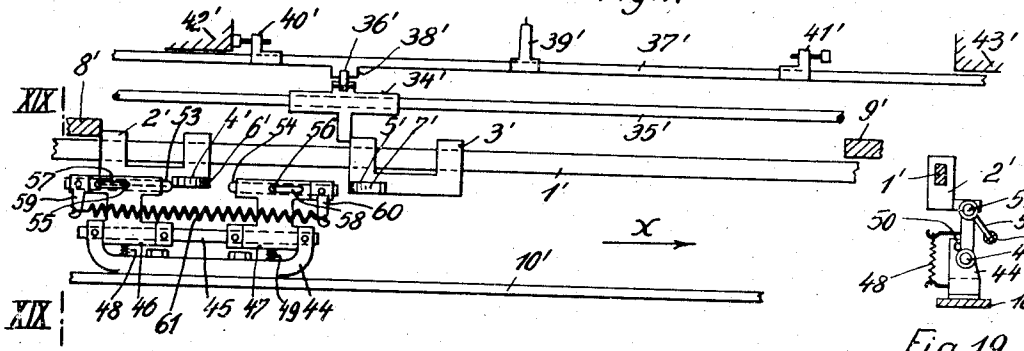


Fig. 19

Fig. 20

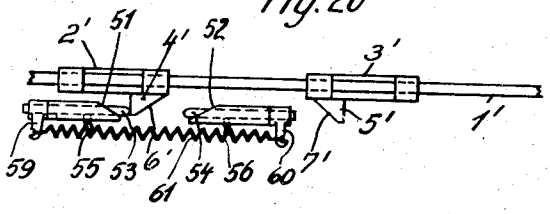
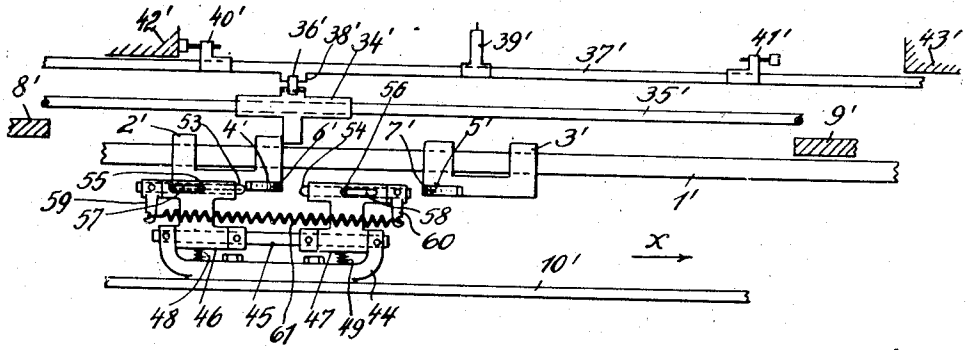


Fig. 12



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FLAT KNITTING MACHINE

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Fig. 13

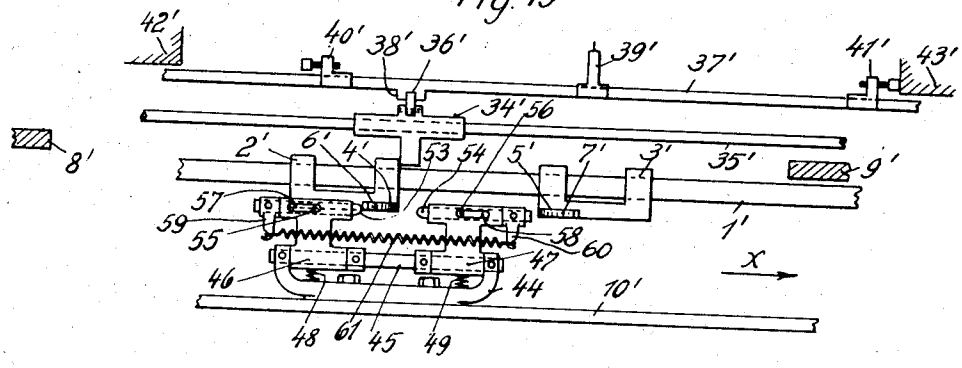
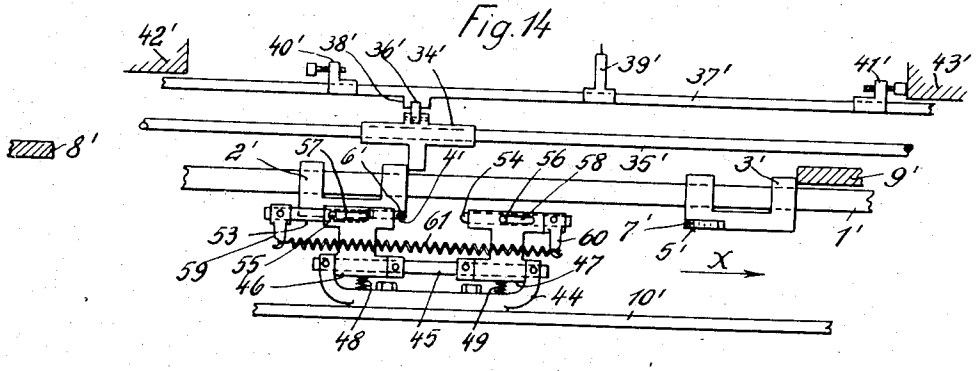


Fig. 14



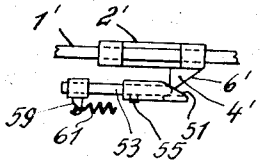


Fig. 21

Fig. 15

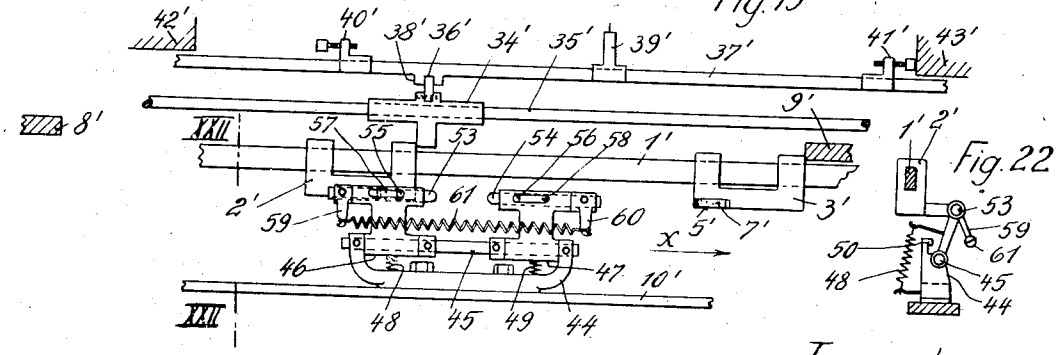


Fig. 22

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FLAT KNITTING MACHINE

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Fig. 16

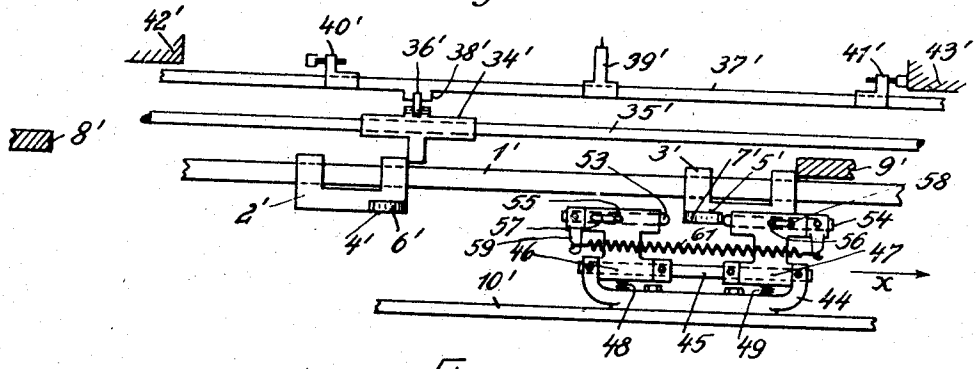


Fig. 17

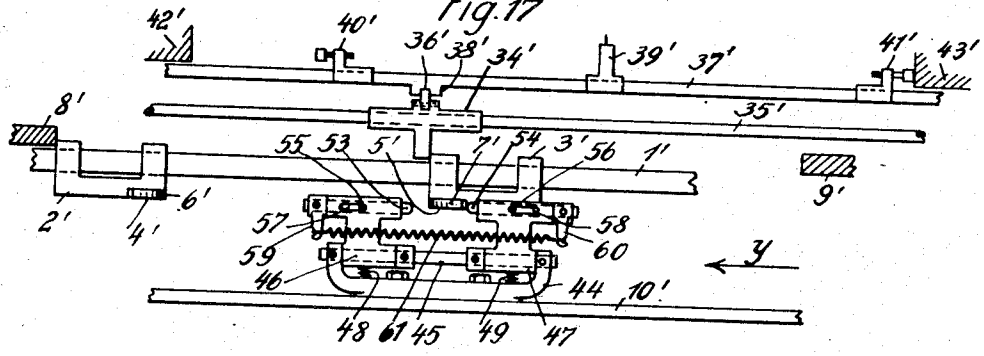
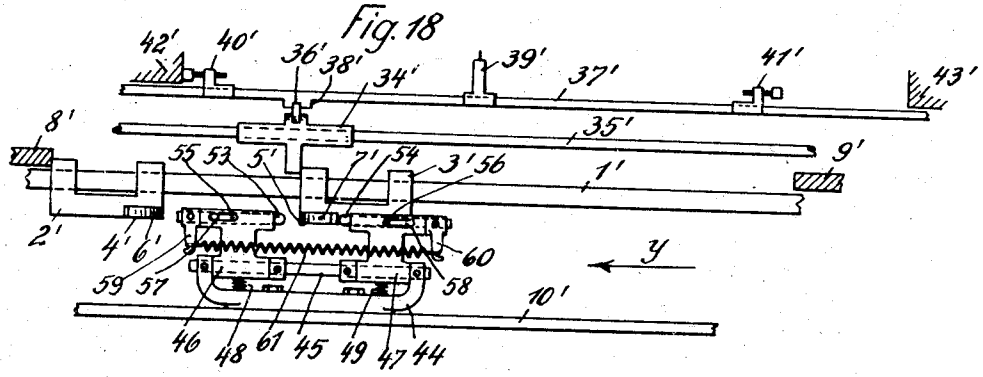


Fig. 18



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UNITED STATES PATENT OFFICE

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FLAT KNITTING MACHINE

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Application November 29, 1940, Serial No. 367,844
In Germany November 30, 1938

6 Claims. (Cl. 66—130)

The present invention relates to driving mechanisms for the plating thread guide bars of flat knitting machines and more particularly refers to a mechanism provided with devices for preventing rebounds produced by the plating thread guide bars striking against the stops limiting their stroke.

The driving mechanisms for the plating thread guide bars hitherto known consist of two brakes which alternately serve as leading brake and as lagging brake and between which a driver for the plating thread guide bar is arranged. The brake serving as lagging brake shifts the driver in both directions and holds same at the end of the stroke of the plating thread guide against the corresponding stop, thereby warranting the leading of the plating thread guide with regard to the falling sinkers, because after reversal the brake now serving as lagging brake shifts the driver only after the compensation distance between the driver and the brake has been traversed.

These plating devices have the serious drawback that very low operating speeds only may be obtained. At higher speeds a poor plating or break of thread results due to vibrations occurring on striking of the thread guide bars against the stops.

Various devices have, moreover, become known which have been developed to remove the above mentioned drawbacks. However, a partial success only has been achieved with all the devices proposed hitherto.

Now, all these drawbacks are removed by the subject matter of the invention by providing cams at the plating thread guide brakes the sides of which facing each other having inclined surfaces upon which resilient arms, movably arranged in members fixed to the slurs moving bar, act during the entire plating stroke and in an increasing degree also during the entire striking operation.

In the accompanying drawings two constructions of a driving mechanism for the plating thread guide bars of a flat knitting machine according to the invention are shown by way of example. The drawings only illustrate the elements of the machine necessary to understand the operation of the driving mechanism forming the subject matter of the present invention.

In these drawings:

Figs. 1 to 8 show various operative positions of the individual members of the first construction during plating,

Fig. 1 is a front elevation showing the initial position of the two brakes for performing movement from left to right,

Fig. 2 shows in front elevation the position of the individual members in the moment the lagging brake strikes against the driver during movement from left to right,

Fig. 3 illustrates in front elevation the position of the individual members at the end of the plating stroke from left to right in the moment the plating thread guide bar strikes against the stop limiting its stroke,

Fig. 4 shows in front elevation the final position of the brakes if the leading brake strikes against its stop limiting the stroke and if the movable stop mounted upon the slurs moving bar starts to change its position with regard to the cam of the lagging brake,

Fig. 5 is a front elevation showing an intermediate position of the individual members during continuation of movement of the slurs moving bar,

Fig. 6 shows in fornt elevation the change of position of the movable stop mounted upon the slurs moving bar with regard to the cam at the leading brake,

Fig. 7 illustrates in front elevation the position of the individual members if the lagging brake strikes against the driver and the leading brake strikes against the stop limiting its stroke during the reversed movement of the brakes from right to left,

Fig. 8 is a front elevation showing the individual members at the end of the plating stroke when moving from right to left in the moment the plating thread guide bar strikes against the stop limiting its stroke,

Fig. 9 is a section on line IX—IX of Fig. 1,

Fig. 10 shows a plan view of the brakes and the cams provided on same,

Figs. 11–18 are front elevations showing, in a manner similar to Figs. 1 to 8 relating to the first construction, operative positions of the individual members of the second construction,

Fig. 11 illustrates the initial position of the two brakes when moving from left to right,

Fig. 12 shows the lagging brake striking against the driver during continued movement from left to right,

Fig. 13 illustrates the end of the plating stroke from left to right in the moment the plating thread guide bar strikes against its stop,

Fig. 14 shows the final position of the brakes in the moment the leading brake strikes against its stop limiting the stroke at the beginning of

the change of position of the bolt, mounted to be displaced in a small block of the lagging brake, with regard to the cams on the lagging brake,

Fig. 15 shows a position during continued movement of the slurs moving bar in which the small block of the lagging brake has been swung over the cam of this lagging brake,

Fig. 16 shows the change of position of the bolt, mounted to be displaced in the small block of the leading brake, with regard to the cam on the leading brake by adjustment of the bolt behind the cam,

Fig. 17 illustrates the striking of the lagging brake against the driver and the striking of the leading brake against the stop limiting its stroke during the reversed movement from right to left,

Fig. 18 shows the end of the plating stroke from right to left in the moment the plating thread guide bar strikes against its stop,

Fig. 19 is a section on line XIX—XIX of Fig. 11,

Fig. 20 shows in plan view the position of the bolts with regard to the cams of the brakes according to Fig. 11,

Fig. 21 shows in plan view the position of the bolt with regard to the cam of the lagging brake according to Fig. 14, and

Fig. 22 is a section on line XXII—XXII of Fig. 15.

In the first construction illustrated in Figs. 1–10 the brake bar 1 carries two plating thread guide brakes 2 and 3 upon which cams 4 and 5 respectively are fixed having surfaces 6 and 7 inclined towards the inner side. The two brakes 2 and 3 move between the stops 8 and 9 limiting the stroke of the plating thread guide bars. Fixed upon the slurs moving bar 10 are bearings 11 and 12 in which a rod 15, prevented from longitudinal movements by set collars 13 and 14, is rotatably arranged. The rod 15 carries fixed brackets 16 and 17 provided with pins 18 and 21 respectively on which are mounted movable double-armed levers 19, 20 and 22, 23 respectively. Moreover, cams 26, 27 are swingably mounted upon pins 24, 25 carried by the brackets 16 and 17 respectively. The downwardly directed arms 20 and 23 of the double-armed levers 19, 20 and 22, 23 carry pins 28 and 29 respectively. A spring 30 connects the upwardly directed arms 19 and 22 of the double-armed levers 19, 20 and 22, 23, whereby pins 28, 29 carried by the corresponding downwardly directed arms 20, 23 of the double-armed levers are pressed against the cams 26, 27 respectively which in turn are held in the adjusted position by a spring 31 connecting them. The upper ends of the lever arms 19, 22 extend into the range of the cams 4, 5 provided at the plating thread guide brakes 2, 3 respectively.

Mounted upon the set collar 14 is a stop 32 which, as may be seen from Fig. 9, is pressed against the bearing 12 by a spring 33. The rod 15 hereby is held in its position so that the brackets 16 and 17 and the double-armed levers carried by them occupy a position of rest. Between the two brakes 2 and 3 a driver 34 is adapted to be moved which is mounted upon a rod 35 to be shifted in the longitudinal direction. In a manner known per se the driver 34 carries a movably arranged finger 36 which may be inserted in a slot of a stop 38 provided on the plating thread guide bar 37.

Fixed upon the plating thread guide bar 37 are the plating thread guides 39 one of which only is shown in the drawings. Moreover, adjustable stops 40, 41 arranged upon the plating thread guide bar 37 extend into the path of counter-stops 42, 43 limiting the stroke of the bar 37.

The operation of the driving mechanism described above is as follows:

When starting a plating thread laying, the individual members of the driving mechanism occupy the position shown in Fig. 1. Supposing that movement is effected in the direction of the arrow x from left to right. The brake lying at the rear in the direction of movement is called lagging brake, whereas the other brake is designated leading brake. In the present case the brake 2 is the lagging brake. The brackets 16 and 17 are so arranged that at the beginning of the movement the arms 19 and 22 of the double-armed levers 19, 20 and 22, 23 respectively always lie exactly behind the cams 4 and 5 respectively of the brake which in the case just under consideration serves as lagging brake. As shown in Fig. 1, the arm 19 of the double-armed lever 19, 20 bears against the cam 4 of the lagging brake 2.

If the brake bar 1 is shifted in the direction of the arrow x, the brakes 2 and 3 carried by this bar 1 also are shifted. As the slurs moving bar 10 traverses the same way as the brake bar 1, the lever arm 19 always bears against the cam 4 of the lagging brake 2, so that the latter never can lag, but is positively shifted by the lever arm 19. If now the lagging brake 2 strikes against the driver member 34 mounted upon the rod 35 this driver member 34 is shifted as shown in Fig. 2. By means of the driver finger 36 engaging the stop 38 of the plating thread guide bar 37 the latter together with the plating thread guides 39 also is shifted (Fig. 3). If the plating thread guide movement is stopped by the stop 41 striking against the stop 43 limiting the plating stroke (Fig. 3), the lagging brake 2 is arrested by the driver member 34, whereas the leading brake 3 is shifted by the brake bar 1 continuing to move from left to right until this brake 3 is arrested by striking against the stop 9 limiting the stroke (Fig. 4). In the moment the plating thread guide bar strikes against the stop, the slurs moving bar continues to move so that the arm 19 of the double-armed lever 19, 20 is pressed against the cam 4 by the expanding spring 30 until this lever arm is allowed to return beneath the cam by the action of the spring, whereby any vibrations are dampened or absorbed in the very moment they occur (Fig. 4). This, however, occurs in the moment only, if the striking of the plating thread guide bar against the stop is completely terminated.

If the double-armed lever 19, 20 is swung into the position shown in Fig. 4, the cam 26 controlled by spring action permanently bears against the pin 28 of the lever arm 20. Hereby any rebound is dampened or deadened which might occur during the return movement of the double-armed lever 19, 20 (Fig. 5).

If the movement of the slurs moving bar is continued the arm 22 of the other swingable double-armed lever 22, 23 strikes against the inclined surface 7 of the cam 5 of the leading brake 3 as is indicated in Fig. 10. The arm 22 slides along the inclined surface 7 of the cam 5. The bracket 17, carrying the double-armed lever 22, 23 is hereby caused to be swung or turned together with the rod 15. As soon as the lever arm 22 slides off the cam 5, the spring 33 returns

the rod 15 again into the position of rest. In this position the arm 22 bears against the outer side wall of the cam 5 (Fig. 6). The stop 32 serves to limit this return movement (Fig. 9).

In the manner described movement of the brake bar 1 then is effected from right to left in the direction of the arrow *y*. The brake 3 now operates as lagging brake and the brake 2 as leading brake. The arm 22 of the double-armed lever 22, 23 bears as in the just described movement during the same stroke of the slurs moving bar 10 and the brake bar 1, against the cam 5 of the lagging brake 3, so that the latter positively is shifted. If the lagging brake 3 strikes against the driver member 34, the leading brake 2 is arrested by striking against the stop 8 limiting the plating stroke (Fig. 7). The lagging brake 3 is shifted by the brake bar continuing to move towards the left and this brake by means of the driver finger 36 mounted on the driver member 34 also shifts the plating thread guide bar 37 carrying the plating thread guides 39 until the stop 40 strikes against the stop 42 limiting the plating stroke (Fig. 8). The brakes 2 and 3 now again have the same distance from each other as at the beginning of the operative stroke from left to right (Fig. 1).

The moment the stop 40 of the plating thread guide bar 37 strikes against the stop 42, the slurs moving bar continues to move, as hereintobefore described, so that the arm 22 of the double-armed lever 22, 23 is pressed against the cam 5 by the expanding spring 30 until this lever arm may return beneath the cam 5 by the action of the spring 30. If the slurs moving the bar 10 is still further moved in the same direction the arm 19 of the double-armed lever 19, 20 strikes against the inclined surface 6 of the cam 4 of the brake 2, slides along this inclined surface thereby turning or swinging the rod 15 and after return movement into the position of rest bears against the cam 4, so that the individual members again occupy the position shown in Fig. 1.

The above described operation is repeated in the manufacture of the following rows of loops.

In the second construction shown in Figs. 11–22 the members 1'—10' and 34'—43' correspond to the members 1—10 and 34—43 respectively of the first construction. A supporting stirrup 44 is fixed upon the slurs moving bar 10' and in this stirrup a shaft 45 is fixed. The latter carries small bearing blocks 46 and 47 which are swingably arranged independent on each other and by means of springs 48 and 49 respectively (Fig. 19) are held in the position of rest against stops 50. At the ends facing each other the small bearing blocks 46 and 47 are provided with faces 51 and 52 respectively inclined towards the stops limiting the stroke of the plating thread guide bar. In the range of the inclined surfaces 51 and 52 bolts 53 and 54 respectively are displaceably mounted parallel to the longitudinal axis of the brake bar 1'. The bolts 53 and 54 carry pins 55 and 56 respectively engaging into slots 57 and 58 of the bearing blocks 46 and 47 respectively. Mounted upon the outer ends of the bolts 53 and 54 are hooks 59 and 60 respectively connected together by a spring 61 and holding the bolts in the position shown in Fig. 20.

Between the two brakes 2' and 3' a driver 34' is adapted to be moved which is mounted upon a rod 35' to be shifted in the longitudinal direction. Mounted upon the driver 34' is a finger 36' which in a well known manner is movably arranged and may be inserted into the slot of the stop 38' carried by the plating thread guide bar 37'. Fixed upon the latter are the plating thread guides 39' one of which only is shown in the drawings. Moreover, adjustable stops 40', 41' are mounted upon the plating thread guide bar which extend into the path of stops 42', 43' respectively limiting the stroke.

The operation of the driving mechanism shown in Figs. 11–22 is as follows:

When starting a plating thread laying the individual members of the driving mechanism occupy the position shown in Fig. 11. Supposing that movement is effected in the direction of the arrow *x* from left to right. The brake lying at the rear in the direction of movement is called lagging brake, whereas the other brake is designated leading brake. In the present case the brake 2' is the lagging plating thread guide brake. The small bearing blocks 46 and 47 are so arranged that at the beginning of the movement their bolts 53 and 54 respectively always lie exactly behind the cams 4' and 5' respectively of the brake which in the case just under consideration serves as lagging brake. As shown in Fig. 11 the bolt 53 bears against the cam 4' of the lagging brake 2'.

If the brake bar 1' is moved in the direction of the arrow *x* the plating thread guide brakes 2' and 3' mounted upon same are displaced. As the slurs moving bar 10' traverses the same way as the brake bar 1', the bolt 53 always bears against the cam 4' of the lagging brake 2' so that the latter never can lag, but is positively shifted by the bolt 53. If now the lagging plating thread guide brake 2' strikes against the driver 34' mounted upon the rod 35', the driver 34' is shifted (Fig. 12). Due to the driver finger 36' engaging the stop 38' of the plating thread guide bar 37', the latter also is shifted together with the plating thread guides 39'. If the movement of the plating thread guides is stopped by the stop 41' striking against the stop 43' limiting the stroke (Fig. 13), the lagging brake 2' is arrested by the driver member 34', whereas the leading brake 3' is shifted by the brake bar 1' continuing to move to the right until it is arrested by striking against the stop 9' (Fig. 14). In the moment the plating thread guide bar strikes against the stop, the slurs moving bar continues to move so that the bolt 53 is pressed axially into the inclined surface 51 of the small bearing block 46 against the action of the spring 61 until the inclined surface 51 of this small bearing block may be swung along the cam 4' against the action of the spring 48 (Figs. 15 and 22). This, however, occurs only if the plating thread guide bar firmly bears against the stop, i. e. if all the vibrations occurring due to the stop have been absorbed or deadened.

If the movement of the slurs moving bar is continued the other small bearing block 47 strikes against the inclined surface 7' of the cam 5' of the leading brake 3' and thereby is swung until under the action of the spring 49 the bolt 54 adjusts itself behind the cam 5' (Fig. 16).

In the manner already described the movement of the brake bar 1' from right to left in the direction of arrow *y* (Figs. 17 and 18) then is effected, whereupon the individual members again occupy the position shown in Fig. 11 and the described operation is repeated.

What we claim is:

1. A driving mechanism for the plating thread guide bars of flat knitting machines provided with means preventing rebounds due to the plat-

ing thread guide bars striking against stops limiting their stroke, comprising slurs, a bar moving said slurs, a brake bar, two plating thread guide brakes mounted on said brake bar, a cam carried by each plating thread guide brake, the cams mounted on said brake bar having surfaces inclined towards each other, brackets fixed on said slurs moving bar and spring actuated pivotally arranged means cooperating with said inclined surfaces of said cams and with said cams.

2. A driving mechanism as set forth in claim 1 in which double-armed levers are movably mounted on said slurs moving bar and cams are swingably connected to bearings of said double-armed levers, the arrangement being such that said double-armed levers cooperate with said plating thread guide brakes in such a manner, that, on the plating thread guide bars striking against the stops limiting their stroke, the upwardly directed arm of one of said double-armed levers, resiliently bearing against the cam provided at the brake, serving in the case under consideration as lagging brake, and forming a support for the corresponding brake during the entire stroke, is by its continued movement together with the slurs moving bar shifted with increasing spring action until it is allowed to return beneath said cam into the exit position, whereas the upwardly directed arm of the other double-armed lever, also actuated by a spring, moves upwardly along the inclined surface of the cam, provided at the brake serving in the case under consideration as leading brake, and adjusts itself behind said last mentioned cam, said cams provided at the bearings of said double-armed levers being pressed against the downwardly directed arms of both said double-armed levers.

3. A device as set forth in claim 1 in which two small bearing blocks, adapted to be swung independently on each other, are mounted upon a common shaft arranged in a stirrup fixed upon said slurs moving bar, said small bearing blocks being provided with inclined surfaces directed towards stops limiting the movement of said thread guide bars, and in which spring-pressed bolts are mounted to be shifted parallel to the longitudinal axis of said brake bar which cooperate with the cams of the plating thread guide brakes in such a manner, that on the plating thread guide bars striking against stops limiting their stroke the arm of the double-armed lever bearing against the cam provided at the brake, serving in the case under consideration as lagging brake, and providing a support for the corresponding brake during the entire stroke, is shifted by the continued movement of its small bearing block together with the slurs moving bar, and the one bolt is pressed with increasing spring pressure into the inclined surface of its small bearing block until said inclined surface is allowed to unimpededly move upwardly along the cam of the brake and the corresponding small bearing block, due to its swinging movement, is allowed to clear said cam, whereupon the other small bearing block, also provided with a bolt actuated by spring pressure, moves upwardly along the inclined surface of the cam provided at the brake serving in the case under consideration as leading brake and with its bolt bears behind this cam.

4. A driving mechanism as set forth in claim 1 in which a rod mounted upon said slurs moving bar is rotatably arranged in bearings fixed upon said slurs moving bar and in which members are fixed to said rod carrying double-armed levers the upwardly directed arms of which are connected by a spring, while cams deadening rebounds press against the downwardly directed arms of said two double-armed levers also connected together by a spring.

5. A driving mechanism as set forth in claim 1 in which a spring actuated rod mounted upon said slurs moving bar is arranged in bearings fixed upon said slurs moving bar and maintained in its position by stops bearing against said bearings and in which members are fixed to said rod carrying double-armed levers the upwardly directed arms of which are connected by a spring, while cams deadening rebounds press against the downwardly directed arms of said two double-armed levers also connected together by a spring.

6. A device as set forth in claim 1 in which two small bearings blocks, each actuated by a spring, are mounted upon a common shaft arranged in a stirrup fixed upon said slurs moving bar, said small bearing blocks being provided with inclined surfaces directed towards stops limiting the movement of said thread guide bars, and in which bolts connected together by a common spring are mounted to be shifted parallel to the longitudinal axis of said brake bar, said small bearing blocks cooperating with the cams of the plating thread guide bars striking against stops limiting their stroke the arm of the double-armed lever bearing against the cam provided at the brake, serving in the case under consideration as lagging brake, and providing a support for the corresponding brake during the entire stroke, is shifted by the continued movement of its small bearing block together with the slurs moving bar, and the one bolt is pressed with increasing spring pressure into the inclined surface of its small bearing block until said inclined surface is allowed to unimpededly move upwardly along the cam of the brake and the corresponding small bearing block, due to its swinging movement, is allowed to clear said cam, whereupon the other small bearing block, also provided with a bolt actuated by spring pressure, moves upwardly along the inclined surface of the cam provided at the brake serving in the case under consideration as leading brake and with its bolt adjusts itself behind this cam.

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