

Feb. 25, 1969

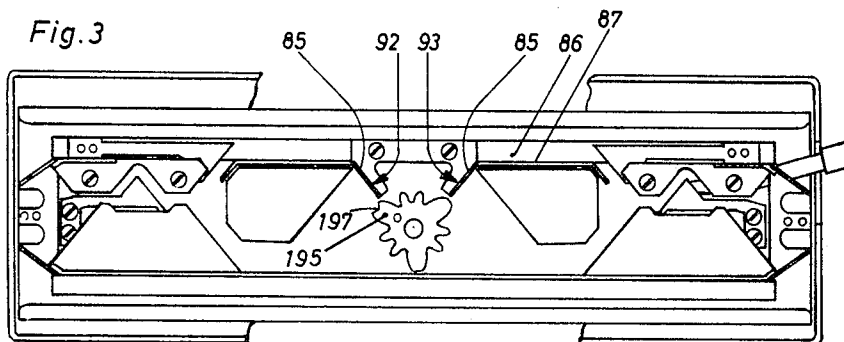
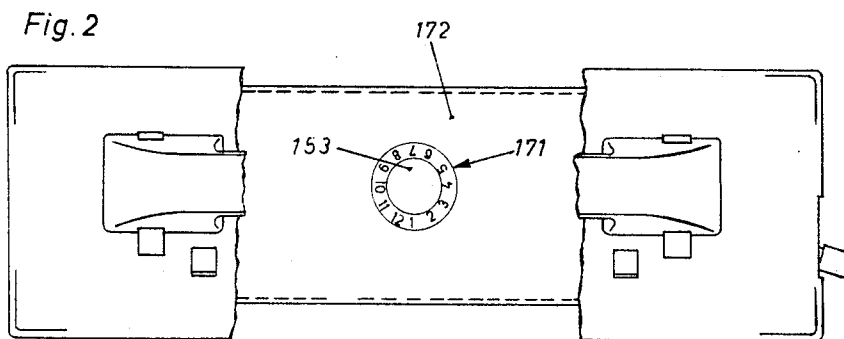
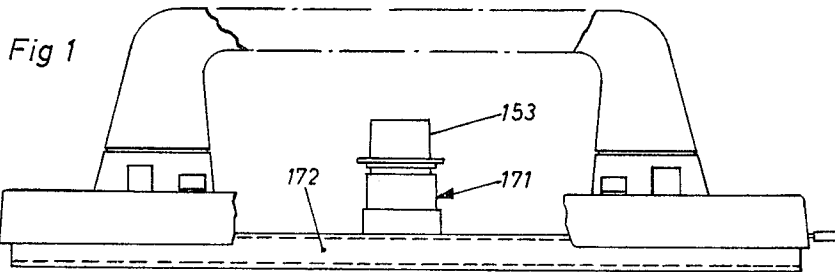
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3,429,145

CAM CARRIAGE FOR KNITTING MACHINE

Filed Aug. 22, 1966

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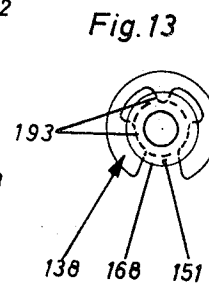
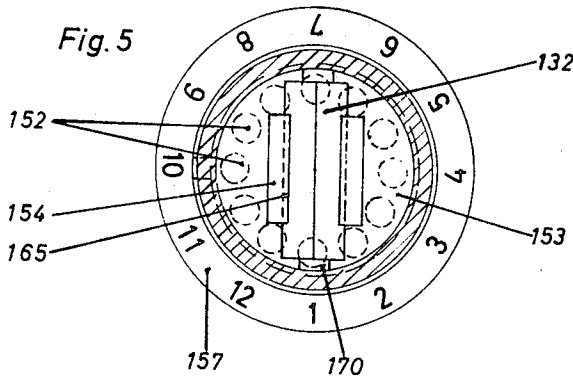
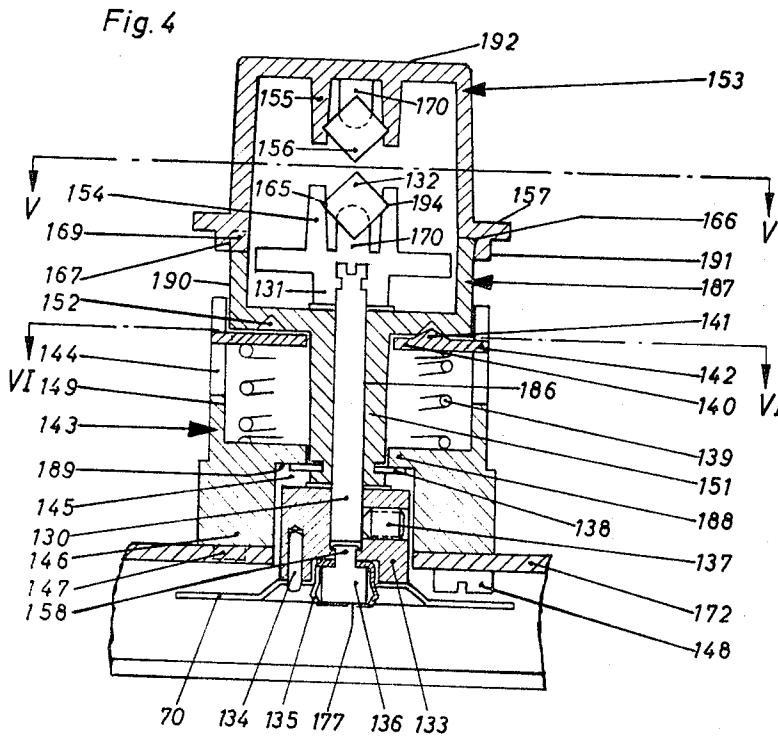
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Fig. 6

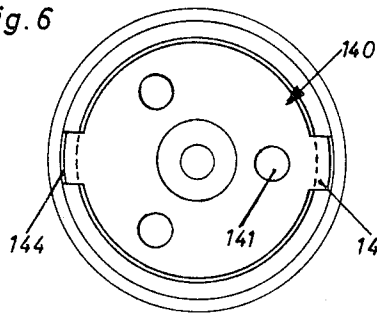


Fig. 7

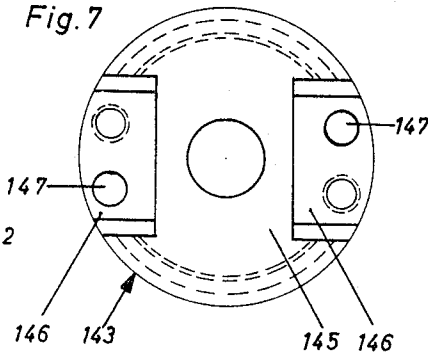


Fig. 9

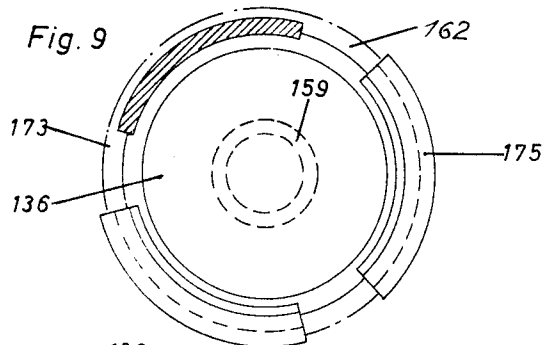
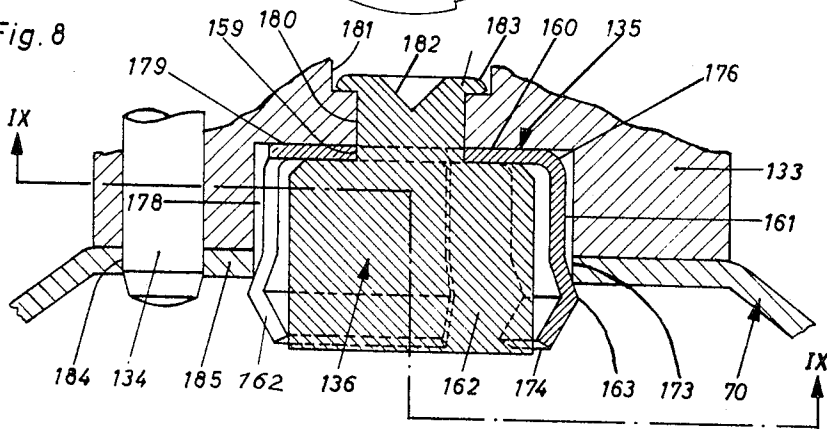


Fig. 8



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Fig 10

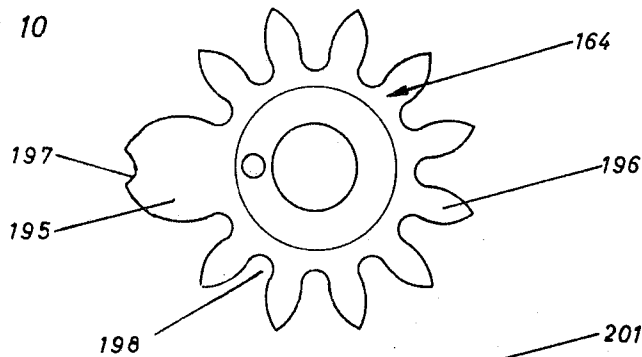


Fig 11

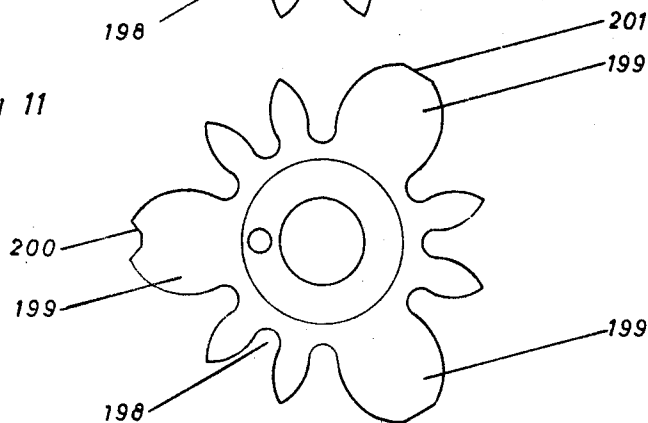
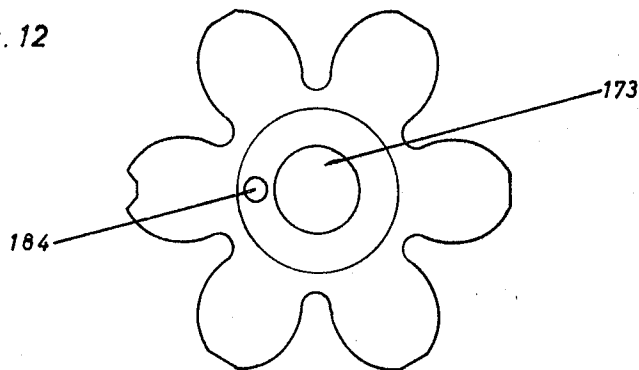


Fig. 12



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Int. Cl. D04b 15/36

14 Claims

ABSTRACT OF THE DISCLOSURE

Cam carriage for knitting machine in which a star wheel is rotated by engagement with the butts of a set of knitting needles across which the star wheel is moved to determine the pattern of knit by selectively displacing certain needles into a retracted position, a selector knob being rotatable about the wheel axis to establish a chosen starting position into which the star wheel is returned by a magnetic coupling upon disengagement of its teeth from the needle butts upon completion of a traverse of the carriage.

The invention concerns a hand-operated knitting machine which works on the principle according to which all needles after each complete carriage movement are located in the insertion position, the needle sinker is divided into two part-needle sinkers, and in the free space between the two part-needle sinkers a ratchet star for the pattern-forming is rotatably arranged on the carriage plate.

The invention consists in that the ratchet star is rotated by the needle butts of the knitting needles, acting like a draw rod, the said butts coming into engagement with the ratchet star.

With the known hand-operated knitting machines, for the beginning of a new reverse movement of the carriage, it was necessary each time—if a patterned course had to be knitted—to set the star to the pattern desired at the time by turning the adjustment knob, thus producing each time at the window the number between 1 and 12 concerned for forming the pattern. This manipulation of the ratchet star is in the long run somewhat tedious, as the operator after each movement of the carriage must adjust the star carefully, to ensure that it is located in the correct starting position.

The invention overcomes these disadvantages by arranging that an automatically acting device ensures that after each carriage movement along over the knitting needles and before the beginning of the next movement of the carriage the star is rotated into the starting position set.

For this purpose the star is carried on a rotatable star shaft loosely carried in a bearing, which shaft in turn is provided with a permanent magnet which can rotate together with the star. Opposite the said permanent magnet a further permanent magnet is arranged, which is fixed to an adjustment knob carried in the housing. The said adjustment knob on the one hand, for adjusting the various patterns, can be displaced in relation to a fixed detent disc in such a way that the adjustment knob can take up various detent positions. The polarity of the two oppositely-lying magnets is such that when the star is freed it tends to take up the position in which the unlike poles lie exactly opposite each other; on the other hand the star wheel, on the movement of the carriage along over the needle butts, can exert rotary movements by overcoming the magnetic power of attraction, which is selected such that though the rotary movement of the star is not seriously hampered, the magnetic force is still sufficient, after each completed carriage movement, in which the star is free, to bring back the star into the particular starting position set.

This arrangement has the advantage that the star, after each movement of the carriage along the needles, runs back into the starting position without any assistance and without the need for supervision, so that foolproof knitting, substantially simpler and quicker from the operator's viewpoint, is made possible.

The invention will now be described with reference to the accompanying drawings, which show an embodiment of the invention but in no restrictive sense.

FIGURE 1 is an elevation of a hand-operated knitting machine showing the mounted star for the production of the pattern;

FIGURE 2 is a top view onto the carriage;

FIGURE 3 is a view of the carriage from below;

FIGURE 4 is a vertical section through the star with its bearing device and the adjustment knob;

FIGURE 5 is a cross-section through the adjustment knob of the device in section along the line V—V of FIGURE 4;

FIGURE 6 is a further section through the device of FIGURE 5 directly above the detent disc, along the line VI—VI of FIGURE 4;

FIGURE 7 is a bottom view of the star device after the removal of the same from the carriage plate and after the dismantling of the star and the movable parts carrying the star;

FIGURE 8 is a vertical section shown in part and on enlarged scale, through the star device of FIGURE 4 in the region of the star;

FIGURE 9 is a cross-section through the part device in accordance with FIGURE 8 along the line IX—IX of FIGURE 8;

FIGURE 10 is the bottom view of a star with a single large tooth;

FIGURE 11 is a similar star, but with three large teeth; FIGURE 12 is a similar star, but with large teeth exclusively; and

FIGURE 13 is the top view onto the safety disc.

As can be seen for FIGURES 1 to 4, the ratchet star device 171 is fixed by means of fixing screws 148 in the centre of the carriage plate in such a way that the star 70 projects somewhat over the lower surface of the carriage plate, as can be seen from FIGURES 3 and 4.

The star 70 is brought into engagement by means of its mid-bore 173 over the spring-bulge 163 of a pot-shaped spring 135. This is made possible because in the pot walling 161, extending from the outer front edge 174, three broad slots 182 are provided, passing to the base 160 of the pot, so that spring-tongues 175 are produced, each of which can swing resiliently about the base 176.

The pot spring 135 is pushed by its pot aperture 159 over the block part 177 of a spring protection member 136, which aperture engages over the rivet pin 158 of the spring protection member. The purpose of the latter is to prevent the thin-walled spring-tongues 175 from being damaged by too strong bending on the manipulation of the equipment, the blockpart acting as better surface to ensure that the bending of the spring tongues does not go too far inwards.

The pot spring together with the spring protection member is inserted with play into a cylindrical spring recess 178 of a star carrying member 133, so that the rivet pin 158 is passed through a bore 180 provided in the base 178 of the spring recess. The said bore is widened above the inwardly projecting rivet-pin-end to form a bearing bore 181 for the star shaft 130. The rivet pin is riveted with the star carrying member 133 by means of a sink hole 182, so that a flanging 183 results.

To ensure the star against turning, in the star carrying member 133 a star pin 134 is provided which projects through a bore 184 of the star. The bore 184 is arranged in the centre-part 185 of the star, which opposite the teeth

is recessed inwardly and abuts on the lower end face of the star carrying member 133.

The star carrying body 133 pushed onto the lower end of the star shaft 130 by means of its bearing bore 181, and is detachably fixed to it by a screw-threaded pin arranged laterally in the star carrying member.

The star shaft 130 is, on the other hand carried inside a sleeve-bore 186 of a sleeve part 151 of the detent bush 187. The detent bush 187 is inserted by its lower sleeve part 151 through a bore of the interposed base 188, and is axially ensured in position by a security disc 138 which engages in a security groove 168 on the sleeve part and abuts against the base surface 189 of a milled out portion 145 in the interior of the guide stand 143.

The milling 145, as FIGURE 7 shows, is arranged transversely through the lower part of the guide stand, so that on both sides there are stand feet 146, which in each case have fixing bosses on their under face that engage in corresponding openings in the carriage plate 172, the fixing screws 148 being screwed from below in screw-threaded bores 173 in the stand feet.

The guide stand 143 continues upwardly in a guide cylinder 149 which has diametrically opposite guide grooves 144, running parallel to the cylinder axis and open upwardly, so that the two guide tabs 142 of the detent disc 140 can be inserted from above into the said guide grooves. Moreover the outer diameter of the said detent disc, allowing sufficient play, is less than the interior diameter of the guide cylinder 149.

The detent disc 140 is pressed by means of a helical pressing spring 139 upwardly against the lower face of the detent bush 187. Three detent bosses 141 arranged at the top of the detent disc 140 engaging in three of the twelve conical detents 152 arranged on the lower face of the cylinder widening 190 of the detent bush 187.

The upper end of the star shaft 130 is embedded into the interior of a plate-like magnet carrying member 131 consisting of plastics material produced by injection moulding or pressing. At the top of the carrier member 131 there are lower holding claws 154 lying oppositely, which in the surfaces facing each other, in the vicinity of the upper edges, have holding grooves 165, into which the lower permanent magnet 132, quadratic in cross-section, engages with its oppositely-lying longitudinal edges. As permanent magnet, use can be made for instance of the permanent magnet material known under the registered trademark Oerstit. In order to ensure the magnets 132 against displacement in the longitudinal direction, restricting flaps 170 are provided on the magnet member 131 which surround the end faces of the magnet.

On the edge of the cylinder widening 190, provided at the top with an outwardly projecting conical bulge 166, a hollow-cylindrical adjustment knob 153 snaps in resiliently with its cylinder flange 191.

The adjustment knob 153 has above the cylinder flange 191 a scale flange 157 which, as FIGURE 5 shows, has in even distribution, visible from the top, the numbers 1 to 12. On the base surface 192 of the adjustment knob two upper holding claws 155 are arranged inside, which ensure the position of the upper magnet 156 by the limiting flaps 170.

In order to ensure the exact position of the adjustment knob opposite the cylinder widening, on the adjustment knob a fixing projection 169 is provided, which engages into a corresponding fixing groove 167 on the cylinder widening.

The method of operation will be shown in greater detail by means of some examples. First a number of knitting needles, corresponding to the width of the knitting to be produced, are pushed forward by hand out of the idle position, in which all needles of the apparatus are found in the first place, into the knitting position. If for instance a ribbed pattern is to be produced, individual needles must be brought out of the knitting position into the rest position, pushed right forward. For this, use

is made of the star wheel 70, with a ribbed pattern in which by way of example every twelfth needle is to be brought into the ribbed position. For this purpose the star wheel 164 shown in FIGURE 10 is used, which has only one single large tooth 195 and ten small teeth 196. This star wheel is forced over the pot spring 135 from below until the bore 173 of the star wheel snaps over the spring bulge 163, whereby the star has to be turned in such a way that the bore 184 engages over the star pin 135 thereby ensuring the correct position in relation to the star shaft 130.

The adjustment knob 153 is then rotated so that the number 1 (FIGURE 5) comes forward, i.e. shows the position shown in FIGURE 5, the detent bosses 141 gliding over the lower surface of the detent bush until they snap into the pertinent conical detents 152.

The carriage is now moved from right to left, the notching 197 of the large tooth 195 meeting the outermost needle butt of the row of needles brought into the knitting position (FIGURE 3). As a result the star is rotated, moving this needle butt back into the rest position and along one of the shanks 92 or 93, and it is thereby moved onto one of the inner deflecting edges 85, and by this deflecting edge reaches the channel 86 via the upper guiding strip 87. Here the needle butt is found in the rest position, with the result that during the knitting process only a rib loop is made and not a stitch. On further rotation of the star as a result of the carriage movement, the star wheel rolls over the subsequent needle butts, which in each case enter into the gaps 198 between the small teeth 196 until the twelfth needle butt again meets the large tooth 195 and is again pushed into the rest position.

To alter the rib pattern, using the same star wheel and with the setting of the adjustment knob 153 at, for instance, the number 3, which then takes up the position of the number 1 in FIGURE 5, i.e. right in the front, it can be achieved that it is not the first but the third needle (counting from the selvedge needle) which is brought into the rest position by the large tooth 195. Care has to be taken here that with this star wheel having a single large tooth, settings between 1 and 12 come into consideration in order to make possible twelve different variations in the production of the rib pattern.

Using another star wheel, as shown in FIGURE 11, which has three large teeth 199, every fourth needle is brought into the rest position through the three large teeth 199, whereas with the use of the star of FIGURE 10 with a single large tooth 195 always only every twelfth needle butt is thrust into the rest position. It is noticeable that with the star wheel of FIGURE 11, only one of the three large teeth has a head notch 200. This is the case because such a notch is necessary only at the beginning of the carriage movement when a large tooth meets the first needle butt, so that the needle butt does not slide off the head of the large tooth. The other two large teeth 199 do not require such notching because the star, is held by the adjacent needle butts which engages in gaps 198, so that the needle butt cannot slide off the head 201 of the large star tooth.

With this needle star also, by setting the adjustment knob 153 it can be arranged that the first, second, third or fourth needle (calculated from the right-hand side of the knitting width) is in each case brought into the rest position by setting the adjustment knob 153 to the numbers 1 to 4. Setting at the number 5 is inadmissible in this case, as then the first needle butt meets the smooth knob 201 of the second large tooth 199 and would slide off this. Accordingly only setting to numbers 1 to 4 should be undertaken, by which all possible variations are exhausted when using this star.

Finally, in a further example of a star (FIGURE 12) which consists solely of large teeth, i.e. six large teeth, setting by the adjustment knob is permissible only in the number range 1 and 2, all possible variations being ex-

hausted thereby, as in this case only the first or the second needle butt can be brought into the rest position.

The conical bulge 166 is shaped in the form of a truncated cone widening slightly towards the upper edge which by elastic deformation is made to snap into the inner surface of the cylinder flange 191 of the adjustment knob 153 correspondingly widening slightly conically upwards.

In accordance with FIGURE 13, the security disc 138 has three inwardly projecting projections 193 by which it is brought into resilient engagement in the ring groove 168.

The two magnets 132, 156 are carried in the known way in such a manner that in the rest position they come to stand with their longitudinal edges exactly opposite each other. This has the advantage that because of the strong concentration of the magnetic lines of force an exact rest position is ensured. The magnets could also have been carried in their holding claws in such a way that the rectangular surfaces i.e. exactly opposite each other in the rest position. In that case, however, the exact setting could not be ensured with the same degree of precision, because the magnetic lines of force would distribute themselves over the width of the rectangular surface of the surfaces turned towards each other, with resulting decrease in the density of the magnetic lines, so that accurate setting would not be ensured.

Moreover the bearing of the permanent magnets in the invention has at the same time the further advantage that two further edges 194 for simple, secure and exact bearing of the magnets in corresponding longitudinal grooves 165 of the holding claws can be used, without the said magnets needing to have complicated shape. Finally, the assembly is simple and fool-proof, because it is immaterial in what position the magnets are made to snap into the holding grooves 165, the holding claws yielding resiliently outwardly, since the cross-section of the magnets is selected quadratic.

What we claim is:

1. In a knitting machine having a reciprocable cam carriage and a set of knitting needles displaceable between an operative position and a retracted position by camming formations on said carriage successively engageable with the butts of said needles upon movement of the carriage across said needles, the combination therewith of:

a star wheel rotatably mounted on said carriage with peripheral gaps engageable by the butts of said needles in their operative positions for progressive rotation of said wheel during a carriage stroke, said star wheel having at least one tooth engageable with the butt of an operatively positioned needle for initiating the retraction thereof into said inoperative position;

selector means for establishing a chosen starting position for said star wheel;

and magnetic coupling means between said selector means and said star wheel for returning the latter to said starting position upon disengagement of said star wheel from said butts upon completion of a carriage stroke.

2. The combination defined in claim 1 wherein said selector means comprises a knob rotatable about the axis of said star wheel, said magnetic coupling including a first permanent magnet and a second permanent magnet connected with said knob and said star wheel, respectively, in closely juxtaposed relationship.

3. The combination defined in claim 2 wherein said magnets are bars with a polygonal profile and are mounted at right angles to said axis with longitudinal edges confronting each other.

4. The combination defined in claim 3 wherein said profile is square, the mounting of each magnet including

a pair of resilient claws with confronting grooves receiving other longitudinal edges of the bar.

5. The combination defined in claim 2, further comprising indexing means coupled with said knob for releasably retaining same in any one of a plurality of possible starting positions.

6. The combination defined in claim 5 wherein said star wheel is provided with a shaft carrying said second magnet, said indexing means including an extension of said knob forming a trunnion for said shaft, said carriage being provided with a socket for said trunnion, said socket and said trunnion being provided with co-operating formations interengageable in any of said possible starting positions.

7. The combination defined in claim 6 wherein said trunnion is provided with a cylindrical head adjoining said knob and coupled therewith for joint rotation, said head and said knob being hollow and together forming a space accommodating said magnets.

8. The combination defined in claim 7 wherein said formations include a set of peripherally spaced recesses on said head, said socket being provided with a spring-loaded nonrotatable disk axially slidable on said trunnion and provided with a projection fitting into said recesses.

9. The combination defined in claim 7 wherein said head has an outwardly flared skirt adjoining said knob, the latter being provided with an annular flange matingly embracing said skirt.

10. The combination defined in claim 6 wherein said shaft is provided, at its end remote from said knob, with a hub for said star wheel, further comprising resilient retaining means for removably holding said star wheel onto said hub.

11. The combination defined in claim 10 wherein said resilient retaining means comprises a cup spring with peripheral slots defining a plurality of integrally interconnected tongues, said star wheel having a central aperture receiving said tongues, each of said tongues having an outer bulge yieldably holding said star wheel onto said hub.

12. The combination defined in claim 11, further comprising a protective central member secured to said hub between said tongues for limiting inward deflection of the latter.

13. The combination defined in claim 12 wherein said hub has an axial bore receiving said shaft, said bore being formed with an annular shoulder beyond said remote end of said shaft, said cup spring having a base with a central opening aligned with said bore, said central member having a neck traversing said opening and said bore with a riveted-over extremity engaging said shoulder.

14. The combination defined in claim 11, further comprising a locator pin eccentrically disposed on said hub, said star wheel having an eccentric hole engaged by said pin for preventing relative rotation between said star wheel and said shaft.

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