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PATENT SPECIFICATION

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(19)

(54) A DRAWING INSTRUMENT

(71) We, HELIX INTERNATIONAL LIMITED, a British Company, of Helix Works, Engine Lane, Lye, Stourbridge, West Midlands DY9 7AJ, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to drawing instruments in the form of drawing compasses or dividers.

An object of the invention is to provide a drawing compass, or dividers, of a construction such as to enable the instrument to be inexpensively made as a mass-produced article suitable for use by, for example, school-children.

According to the invention, there is provided a drawing instrument which is a compass or dividers having a leg and an arm, or two legs, pivoted together at inner ends thereof, and which has a pivotally-mounted upwardly-projecting top terminal part which can be grasped between finger and thumb when using the instrument and which is hereinafter termed a "bow top", said bow top having fork limbs embracing the assemble of pivoted ends of the leg and arm or of the two legs, said leg and arm, or said legs, and said limbs of the bow top, having therein pivot holes receiving a pivot which pivots together the leg and arm, or the legs, and the bow top, and said bow top having locating means co-operable with the inner ends of the leg and arm, or of the legs, to prevent, during assembly of the instrument before installation of the pivot, movement of said ends towards the bow top beyond a position in which the said pivot holes in said ends and said bow top are aligned for receiving the pivot.

Thus, assembly of the bow top to the leg and arm, or legs, is facilitated in a time-saving manner which can result in lowering the production cost of the instrument compared with the cost of producing an instrument in which no means are provided for aligning the pivot-receiving holes for receiving the pivot.

Preferably, there is provided a centralising member held between, and keyed to, said inner ends of the leg and arm, or of the two legs, and projecting up into an interior aperture or recess in the bow top whereby angular movement of the leg, or the one leg, relatively to the arm, or the second leg, causes the centralising member to press against a side wall of said interior aperture or recess to cause the bow top to turn to keep central; said centralising member having therein a pivot-receiving hole receiving the pivot which pivots together the leg and arm, or the legs, and the bow top, the locating means, with which the bow top is provided, preventing, during assembly of the instrument with the centralising member keyed in place between said inner ends of the leg and arm, or of the two legs, but before installation of the pivot, movement of said ends, with the centralising member keyed in place therebetween, towards the bow top beyond a position in which the said pivot-receiving holes in said ends and said bow top are aligned for receiving the pivot.

Preferably, the aforesaid locating means co-operable with the inner ends of the leg and arm, or of the legs, comprise shoulders or projections provided on, and integral with, inside faces of the fork limbs of the bow top. Said locating means preferably comprise two pairs of shoulders or projections disposed one pair on the inside face of, and integral with, each fork limb of the bow top, with the two shoulders or projections of each pair being spaced apart to receive between them a curved top edge portion of a respective one of the aforesaid inner ends. Preferably each shoulder or projection on said two pairs of shoulders or projections has a rounded or oblique outer and surface, whereby said rounded or oblique outer end surfaces form lead surfaces for centering the inner ends of the leg and arm, or of the legs, with respect to a

centre line of the bow top during assembly of the instrument, before insertion of the pivot.

The pivot which pivots together the leg and arm, or the two legs, may be a screw or bolt held in place by a nut, and the bow top may be of plastics material, and one of the fork limbs of said plastics bow top may have an exterior face having a coned recess surrounding, and co-axial with, the pivot hole in said limb, said coned recess being of countersunk form into which, when the said pivot screw or bolt is tightened, said nut is drawn whereby to embed itself firmly into the plastics material of said limb. Preferably, the other fork limb has an exterior face having a coned recess of countersunk form to receive the head of the said screw or bolt.

In the accompanying drawings which show, by way of example, a drawing compass constructed in accordance with the invention:

Figure 1 is a front view of a compass;

Figures 2 and 3 are sections, on the lines II—II, Figure 1; and III—III, Figure 1 respectively, through the top portion of the compass shown in Figure 1;

Figure 4 is an inside face view of the upper portion of a leg of the compass shown in Figure 1;

Figure 5 is an outside face view of the upper portion of an arm of the compass shown in Figure 1 (Figures 4 and 5 are on a larger scale than the other Figures);

Figure 6 is a longitudinal section through a bow top of the compass shown in Figure 1; and

Figures 7 and 8 are two views of a modified bow top, Figure 7 being a section on the line VII—VII, Figure 8.

Referring to Figures 1 to 6 of the drawings, a drawing compass comprises a die-cast metal leg 1 provided with a pointed element 2 at its one end and pivoted at its other or inner end, by means of a mild steel pivot screw 3, to one end of a shank 4 of a die-cast arm 5, said shank 4 having at its other or outer end an integral laterally-projecting stub or barrel 6 which has an external screw thread 7 thereon and which is formed with a socket hole 8 for receiving a pencil or the like. An internally screw-threaded knurled clamping ring 9 is mounted on the stub or barrel 6 and is operatively engaged with the external screw thread 7, said ring 9 being for clamping the pencil or the like in place in the socket hole 8 in the stub or barrel 6.

The leg 1 of the compass shown is provided at its pivoted end with an integral die-cast stop projection 12 and an arcuate recess 13, and with a plain hole 14 for the pivot screw 3, said projection 12, recess 13 and hole 14 being formed in the die-casting of the said leg 1. The arm 5 is, in the die-casting of the said arm, provided at its pivoted end with an integral die-cast stop projection 15 identical with the projection 12, an arcuate recess 16 identical with the recess 13, and a plain hole 17 for engagement by the pivot screw 3. The stop projection 12 engages into the recess 16 and the stop projection 15 engages into the recess 13, whereby to provide simple and robust stop means acting against angular opening out movement of the parts 1, 5, relatively to each other, beyond a predetermined angular limit.

The compass shown is provided with a bow top 18 which is of nylon and which has integral fork limbs 19 which, embrace the assembly of pivoted ends of the leg 1 and arm 5, and said bow top 18 is held in place by the pivot screw 3, which engages holes 20 in the said fork limbs 19. The bow top 18 has therein an interior recess 21 having a mouth presented towards the pivoted-together ends of the leg 1 and arm 5; and mounted on the pivot screw 3, and held between said pivoted-together ends of the leg 1 and arm 5, is a steel centralising plate 22 provided with a pair of elongate holes which are respectively engages one with each of the projections 12, 15, whereby the plate 22 is keyed to said pivoted-together ends of the leg 1 and arm 5. The plate 22 has an integral upper tongue portion 23 which projects into the interior recess 21 in the bow top, whereby angular movement of one of the members 1,5 relatively to the other of said members 1,5 causes the tongue portion 23 of the centralising plate 22 to press against a wall of said recess 21 to cause the bow top 18 to turn, about the axis of the screw 3, to keep central with respect to the parts 1,5. The screw 3 passes through a hole 24 in the centralising plate 22, said hole 24 being elongated to permit the plate 22 to move transversely to the pivot screw 3 when turning about said screw 3.

The pivot screw 3 is held in place by a mild steel nut 25 thereon adjacent the outer face of one of the fork limbs 19 of the bow top 18. Said outer face of said limb 19 has, surrounding, and co-axial with, the pivot hole 20 in the limb, a coned recess 26 of countersunk form into which, when the screw 3 is tightened, the nut 25 is drawn whereby to embed itself firmly into the nylon material of the limb 19. The coned shape of the recess 26 assists the embedding of the nut 25 into the nylon material, and has a further advantage, in that, compared with a case in which a nut is received in a hexagonal recess, the nut 25 can be drawn into the recess 26 irrespective of the rotational position of the nut 25 on the screw 3, whereas if the recess were hexagonal, the nut would have to be

positioned so that its corners were in register with the corners of the recess, before it could be drawn into the recess. The outer face of the other limb 19 of the bow top is provided with a coned recess 27 of countersunk form for receiving the head of the screw 3, said head being drawn into said recess 27, and embedding into the nylon material of said other limb, when the screw is tightened up.

Provided on, and integral with, the inside face of each fork limb 19 of the nylon bow top 18 is a pair of shoulders or projections 28 which are spaced apart so as to receive between them, as shown in Figure 6, a curved top edge portion 29 of a respective one of the pivoted together inner ends of the leg 1 and arm 5, the two shoulders or projections 28 on the one limb 19 snugly receiving between them a curved top edge portion 29 of the inner end of the leg 1, and the two shoulders or projections 28 on the other limb 19 snugly receiving between them a curved top edge portion 29 of the inner end of the arms. In assembling the compass shown, the inner ends of the leg 1 and arm 5 are, before installation of the pivot screw 3, positioned together side-by-side with the centralising plate 22 located therebetween and keyed in place by the stop projections 12, 15, and the resulting sub-assembly of the leg 1, arm 5 and plate 22 is moved relatively to the bow top 18 so that the inner ends of the leg 1 and arm 5 enter between the fork limbs 19 and the tongue portion 23 of the centralising plate enters the interior recess 21 in the bow top. The shoulders or projections 28 act as locating means which cooperate with the inner ends of the leg 1 and arm 5 to prevent movement of said sub-assembly towards the bow top beyond a position in which the respective pivot holes 14, 17, 20, 20, in the inner ends of the leg 1, arm 5, and in the fork limbs 19 are all aligned for receiving the pivot screw 3. After, when assembling the compass, the inner ends of the leg 1 and arm 5 have entered between the fork limbs 19, and the tongue portion 23 of the centralising plate has entered the interior recess 21 in the bow top, the movement of the aforesaid sub-assembly is continued relatively to the bow top 18 until said movement is arrested by full engagement of the inner ends of the leg 1 and arm 5 with the respective pairs of the shoulders or projections 28, whereupon the said holes 14, 17, 20, 20 are found then to be correctly aligned for receiving the screw 3, and the latter is then passed through the said aligned holes and secured in place by the nut. Thus the provision of the pivot-hole aligning shoulders or projections 28 considerably facilitates assembly of the compass leg and arm to the bow top. The shoulders or projections 28 have rounded (as shown), or oblique, end surfaces 28[a] which form lead surfaces which, during assembly of the compass, centre the inner ends of the leg 1 and arm 5 with respect to a centre line of the bow top 18 if the aforesaid sub-assembly happens to be offset from said centre line of the bow top when entering between the fork limbs 19.

The compass shown is of a neat and robust construction which can be inexpensively manufactured by mass-production.

The material of the die-cast leg 1 and arm 5 may, for example, be of a zinc-based metal alloy.

The parts of the compass shown may be of any other suitable material, but it is preferred that the leg 1 and arm 5 be of die-cast metal and that the bow top 18 be of plastics material.

If desired instead of the arrangement having the pivot-hole aligning shoulders or projections 28 and the coned recesses 26, 27, shown in Figures 2 and 3 being incorporated in a compass having a leg and an arm, it may be incorporated in dividers having a pair of legs, each of which carries a pointed element at its lower end, with one of said legs corresponding to the leg 1 of the arrangement shown, and with the other leg taking the place of the arm 5.

If desired, the centralising member 22 may be keyed in place in some other way instead of being keyed by stop projections 12, 15; or may be omitted entirely.

Means for limiting opening-out movement may, if desired be other than the arrangement of stop projections 12, 15 and recesses 13, 16 shown. For example, instead of there being two stop projections respectively engaging two arcuate recesses (or apertures), there may be provided only one stop projection and one arcuate recess (or aperture), although the arrangement of two stop projections and two arcuate recesses shown is preferred because of the robustness it imparts.

The bow top may if desired have pivot-hole aligning means, co-operable with the inner ends of the leg and arm (or of two legs), which are of any other suitable form, instead of the two pairs of shoulders or projections 28 shown, but the arrangement shown is preferred. If desired, the bow top having pivot-hole aligning means co-operable with said inner ends may be a bow top of an instrument not having a coned recess for receiving a nut of a pivot screw, and/or a coned recess for receiving a head of a pivot screw.

The instrument shown in Figures 1 to 6 of the drawings is of robust construction, but if the instrument is misused by applying excessive opening-out force to the parts 1,

5, there is a possibility that such excessive force might cause shearing of the die-cast stop projections 12, 15, in which case the centralising plate 22 shown would become inoperative, as it would no longer be keyed in place. With a view to avoiding such an occurrence, the bow top of the instrument shown may be of the modified form 18' shown in Figures 7 and 8. In this modification, the said bow top 18', which is of nylon or any other suitable material, has two pairs of pivot-hole aligning shoulders or projections 28' which co-operate with the edges 29 of the parts 1, 5. Said shoulders or projections 28' have, similiarly to the projections 28, end surfaces 28^a which form lead surfaces, but in this modified bow top 18' the shoulders or projections 28' have integral lower extensions having oblique surfaces 28^b, two of which (namely one on one of the pair of shoulders or projections 28' on the fork limb, and one on one of the pair of shoulders or projections 28' on the other fork limb, said two surfaces being at opposite sides of the axis of the pivot 3) form stop surfaces respectively engageable with straight edge portions 1^a, 5^a (Figures 4 and 5) of the leg 1 and arm 5 to act against angular opening-out movement of the leg 1 and arm 5 beyond a predetermined angular limit position. Said oblique stop surfaces on the plastics bow top 18' are so located that the two die-cast projections 12, 15 cannot bear against the ends of the respective arcuate recesses 16, 13 before the said oblique stop surfaces bear against the edges 1^a, 5^a. Thus at least part of the shock or strain resulting from such opening out to the limit is taken by the said oblique stop surfaces, and the possibility of opening out with excessive force causing shearing of the die-cast projections 12, 15 is considerably reduced or obviated.

The arrangement shown in Figures 7 and 8 is also shown and described in our co-pending Application No. 24295/77, Serial No. 1,533,349.

WHAT WE CLAIM IS:—

1. A drawing instrument which is a compass or dividers having a leg and an arm, or two legs, pivoted together at inner ends thereof, and which has a bow top having fork limbs embracing the assembly of pivoted ends of the leg and arm or of the two legs, said leg and arm, or said legs, and said limbs of the bow top, having therein pivot holes receiving a pivot which pivots together the leg and arm, or the legs, and the bow top, and said bow top having locating means co-operable with the inner ends of the leg and arm, or of the legs, to prevent, during assembly of the instrument before installation of the pivot, movement of said ends towards the bow top beyond a position in which the said pivot holes in said ends and said bow top are aligned for receiving the pivot.

2. A drawing instrument as claimed in Claim 1, wherein there is provided a centralising member held between, and keyed to, said inner ends of the leg and arm or of the two legs, and projecting up into an interior aperture or recess in the bow top whereby angular movement of the leg, or the one leg, relatively to the arm, or the second leg, causes the centralising member to press against a side wall of said interior aperture or recess to cause the bow top to turn to keep central, said centralising member having therein a pivot-receiving hole receiving the pivot which pivots together the leg and arm, or the legs, and the bow top, the locating means, with which the bow top is provided, preventing, during assembly of the instrument, with the centralising member keyed in place between said inner ends of the leg and arm, or of the two legs, but before installation of the pivot, movement of said ends, with the centralising member keyed in place therebetween, towards the bow top beyond a position in which the said pivot-receiving holes in said ends and said bow top are aligned for receiving the pivot.

3. A drawing instrument as claimed in Claim 1 or 2, wherein the said locating means co-operable with the inner ends of the leg and arm, or of the legs, comprise shoulders or projections provided on, and integral with, inside faces of the fork limbs of the bow top.

4. A drawing instrument as claimed in Claim 1 or 2, wherein the said locating means co-operable with the inner ends of the leg and arm, or of the legs, comprise two pairs of shoulders or projections disposed one pair on the inside face of, and integral with, each fork limb of the bow top, with the two shoulders or projections of each pair being spaced apart to receive between them a curved top edge portion of a respective one of the aforesaid inner ends.

5. A drawing instrument as claimed in Claim 4, wherein each shoulder or projection of said two pairs of shoulders or projections has a rounded or oblique outer end surface, whereby said rounded or oblique outer end surfaces form lead surfaces for centering the inner ends of the leg and arm, or of the legs, with respect to a centre line of the bow top, during assembly of the instrument, before insertion of the pivot.

6. A drawing instrument as claimed in any one the preceding claims, wherein the leg, or the one leg, is provided at its inner end with a stop projection, and an arcuate recess or aperture, respectively engaged with an arcuate recess or aperture in, and a

5, there is a possibility that such excessive force might cause shearing of the die-cast stop projections 12, 15, in which case the centralising plate 22 shown would become inoperative, as it would no longer be keyed in place. With a view to avoiding such an occurrence, the bow top of the instrument shown may be of the modified form 18' shown in Figures 7 and 8. In this modification, the said bow top 18', which is of nylon or any other suitable material, has two pairs of pivot-hole aligning shoulders or projections 28' which co-operate with the edges 29 of the parts 1, 5. Said shoulders or projections 28' have, similiarly to the projections 28, end surfaces 28^a which form lead surfaces, but in this modified bow top 18' the shoulders or projections 28' have integral lower extensions having oblique surfaces 28^b, two of which (namely one on one of the pair of shoulders or projections 28' on the fork limb, and one on one of the pair of shoulders or projections 28' on the other fork limb, said two surfaces being at opposite sides of the axis of the pivot 3) form stop surfaces respectively engageable with straight edge portions 1^a, 5^a (Figures 4 and 5) of the leg 1 and arm 5 to act against angular opening-out movement of the leg 1 and arm 5 beyond a predetermined angular limit position. Said oblique stop surfaces on the plastics bow top 18' are so located that the two die-cast projections 12, 15 cannot bear against the ends of the respective arcuate recesses 16, 13 before the said oblique stop surfaces bear against the edges 1^a, 5^a. Thus at least part of the shock or strain resulting from such opening out to the limit is taken by the said oblique stop surfaces, and the possibility of opening out with excessive force causing shearing of the die-cast projections 12, 15 is considerably reduced or obviated.

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2. A drawing instrument as claimed in Claim 1, wherein there is provided a centralising member held between, and keyed to, said inner ends of the leg and arm or of the two legs, and projecting up into an interior aperture or recess in the bow top whereby angular movement of the leg, or the one leg, relatively to the arm, or the second leg, causes the centralising member to press against a side wall of said interior aperture or recess to cause the bow top to turn to keep central, said centralising member having therein a pivot-receiving hole receiving the pivot which pivots together the leg and arm, or the legs, and the bow top, the locating means, with which the bow top is provided, preventing, during assembly of the instrument, with the centralising member keyed in place between said inner ends of the leg and arm, or of the two legs, but before installation of the pivot, movement of said ends, with the centralising member keyed in place therebetween, towards the bow top beyond a position in which the said pivot-receiving holes in said ends and said bow top are aligned for receiving the pivot.

3. A drawing instrument as claimed in Claim 1 or 2, wherein the said locating means co-operable with the inner ends of the leg and arm, or of the legs, comprise shoulders or projections provided on, and integral with, inside faces of the fork limbs of the bow top.

4. A drawing instrument as claimed in Claim 1 or 2, wherein the said locating means co-operable with the inner ends of the leg and arm, or of the legs, comprise two pairs of shoulders or projections disposed one pair on the inside face of, and integral with, each fork limb of the bow top, with the two shoulders or projections of each pair being spaced apart to receive between them a curved top edge portion of a respective one of the aforesaid inner ends.

5. A drawing instrument as claimed in Claim 4, wherein each shoulder or projection of said two pairs of shoulders or projections has a rounded or oblique outer end surface, whereby said rounded or oblique outer end surfaces form lead surfaces for centering the inner ends of the leg and arm, or of the legs, with respect to a centre line of the bow top, during assembly of the instrument, before insertion of the pivot.

6. A drawing instrument as claimed in any one the preceding claims, wherein the leg, or the one leg, is provided at its inner end with a stop projection, and an arcuate recess or aperture, respectively engaged with an arcuate recess or aperture in, and a

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stop projection on, the inner end of the arm, or the second leg, whereby to constitute stop means acting against angular opening-out movement of the leg, or the one leg, relative to the arm, or the second leg, beyond a predetermined angular limit.

7. A drawing instrument as claimed in Claim 6 insofar as dependent upon Claim 2, wherein the said stop projections engage through apertures in the centralising member whereby the centralising member is keyed to said inner ends of the leg and and arm, or of the legs, by said stop projections.

8. A drawing instrument as claimed in Claim 2, or in Claims 3 to 5 insofar as dependent upon Claim 2, wherein the leg, or the one leg, is provided at its inner end with a projection, and an arcuate recess or aperture, respectively engaged with an arcuate recess or aperture, in, and a projection on, the inner end of the arm, or of the second leg, whereby said projections constitute keying projections which key the centralising member to said inner ends.

9. A drawing instrument as claimed in any one of the preceding claims, wherein the pivot which pivots together the leg and arm, or the two legs, is a screw or bolt held in place by a nut, and the bow top is of plastics material and one of the fork limbs of said bow top has an exterior face having a coned recess surrounding, and co-axial with, the pivot hole in said limb, said coned recess being of countersunk form into which, when the pivot screw or bolt is tightened, said nut is drawn whereby to embed itself firmly into the plastics material of said limb.

10. A drawing instrument as claimed in Claim 9, wherein the other fork limb has an exterior face having a coned recess of countersunk form to receive the head of the pivot screw or bolt.

11. A drawing instrument substantially as herein described with reference to Figures 1 to 6 of the accompanying drawings.

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