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(56) Documents Cited:
WO 2005/050288 A1 **WO 2005/001550 A2**
WO 2004/083938 A2 **WO 2004/049040 A1**
CN 101581831 A **JP 2009294627 A**
JP 2004279675 A **US 6425664 B1**

(58) Field of Search:
INT CL **G02C**
Other: **EPODOC, WPI, TXTE**

(54) Title of the Invention: **Spectacle assembly**
Abstract Title: **Spectacle assembly**

(57) A spectacle assembly 1 comprises an eyeglass frame 2 and a pair of arms 3, 3' connected to the eyeglass frame 2 with respective hinges 4, 4'. Each arm 3, 3' of the spectacle assembly 1 comprises an embedded magnetic element 5, 5'. The magnetic elements 5, 5' are arranged to attract one another to effect a closing force on the arms upon hinging the arms towards the nose bridge 6 of the eyeglass frame 2. This secures the assembly to articles of clothing when in a closed or folded state, the magnetic elements effecting a gripping force about the clothing. The magnetic elements may comprise neodymium in a sintered or bonded magnet and may be cylindrical with diameter 3 to 5 mm and length 2 to 10 mm. Each arm may have two or more magnetic elements, flush with or protruding from the arm, and they may be secured by interference fit or glue.

FIG. 2A

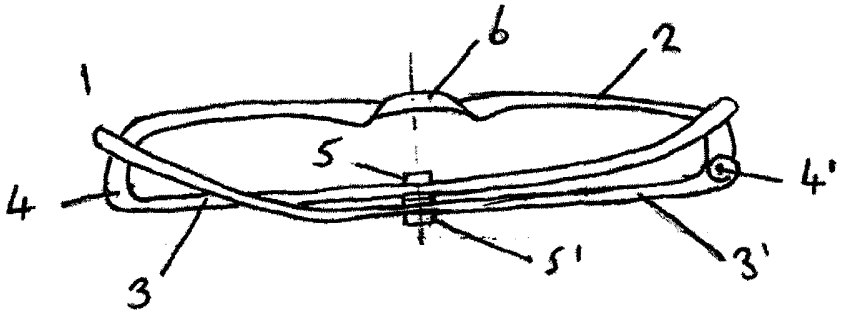

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Fig. 1

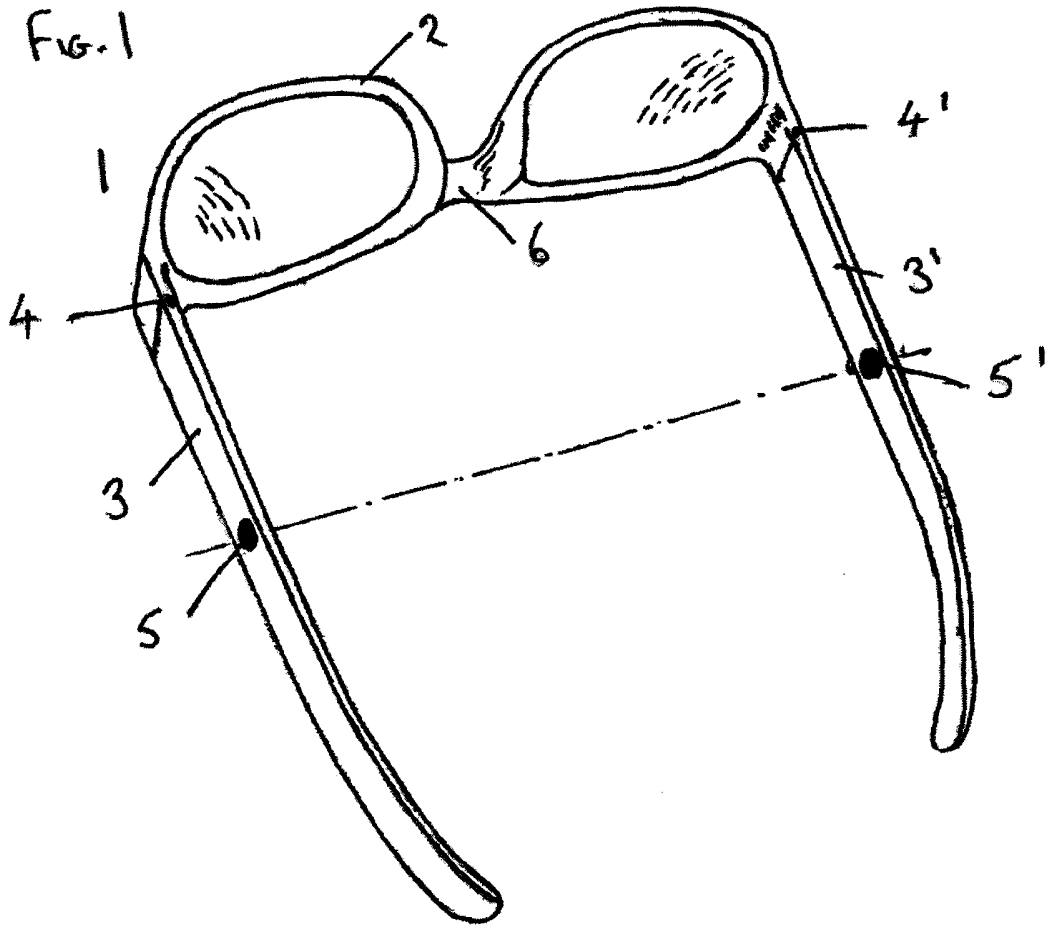


Fig. 2A

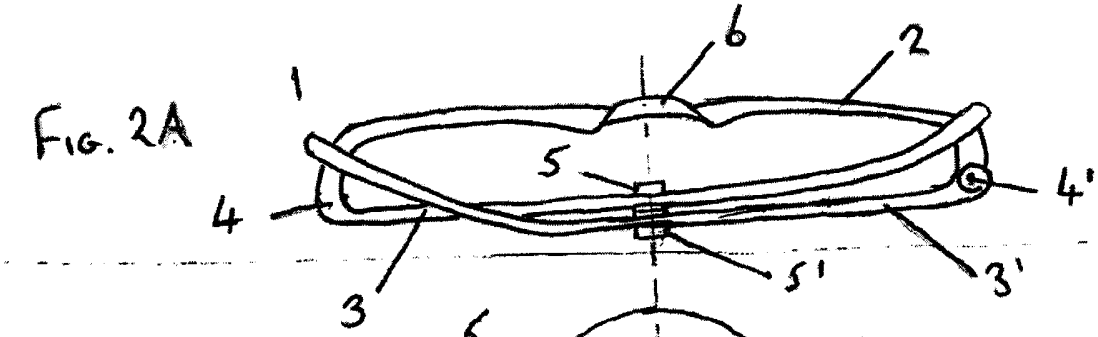
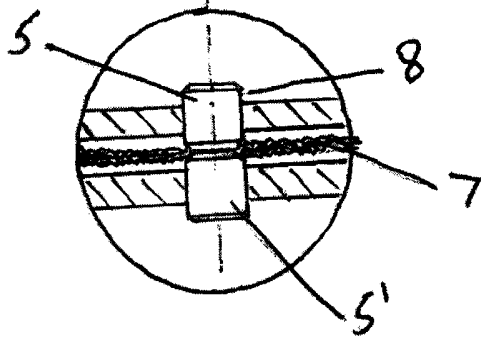


Fig. 2B



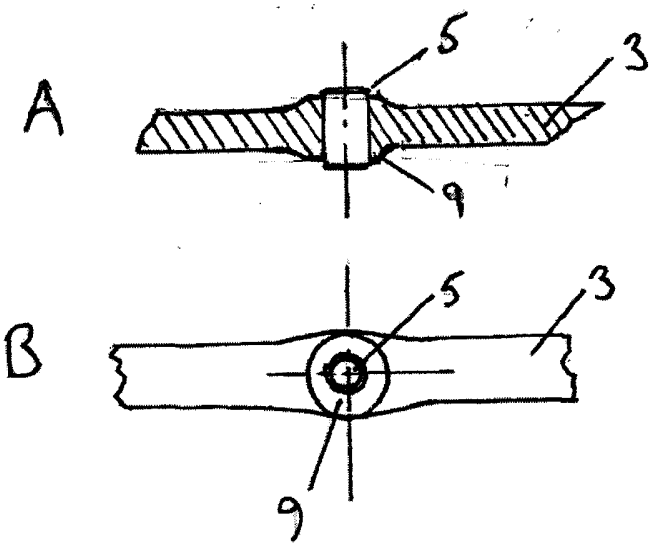


FIG. 3

Fig. 4

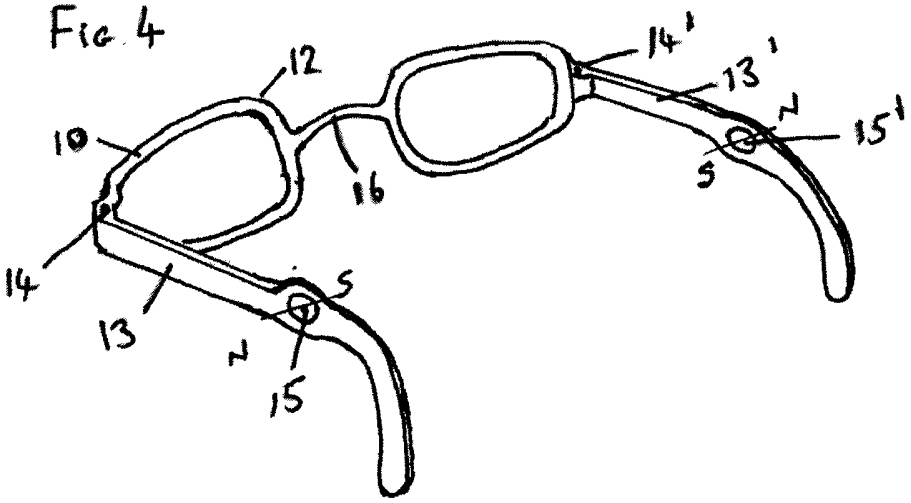
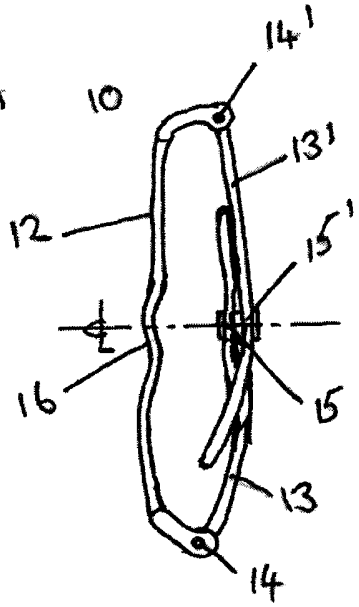


Fig. 5A



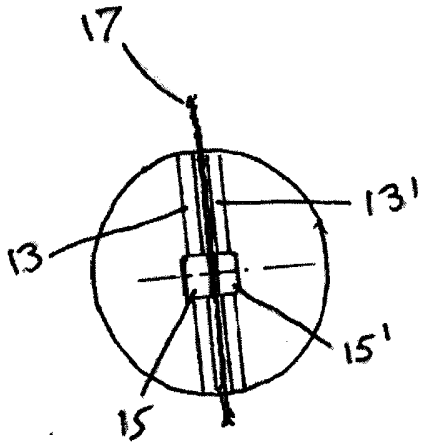


Fig. 5B

SPECTACLE ASSEMBLY

The invention relates to a spectacle assembly comprising magnetic elements and to methods for manufacturing such a spectacle assembly.

Spectacles are typically prone to loss or damage when removed from their natural position shielding an individual's eyes or enhancing their vision. When an individual takes of their spectacles (examples/alternative names include glasses, eyeglasses, sunglasses, goggles or other such variations) the spectacles are often closed and hung from clothing by hooking one arm of the closed spectacles over a rim of clothing, such as a jumper, shirt, belt, pocket, etc. This does not provide a secure fit and the user will often find that the spectacles become dislodged and are lost or damaged by falling.

The problem of preventing loss of spectacles, when in use on an individual's head, may be solved, for example, by attaching a length of cord to each end of the spectacle arms, the cord thus extending around the back of the user's head. This arrangement does not however, address the problem of losing or damaging spectacles when not in use and hooked on the user's clothing.

US 7,172,283 discloses eyeglasses in combination with two magnetic devices, each comprising a magnet coated in a non-ferrous shell and each fitted with two pliable, flexible rings suitable for attaching the magnetic devices to the arms of a pair of glasses. The magnetic devices in US 7,172,283 are each looped onto each arm and arranged such that when the arms of the glasses are closed, the magnetic devices attract each other to effect a closing force capable of attaching the glasses to clothing.

The magnetic devices of US 7,172,283 can be manufactured and sold separately, and attached to many different forms of glasses but there are several disadvantages with using these magnetic devices. The magnetic devices may slip and rotate on the glasses arms and thus move out of alignment and fail to attract one another to effect a closing force. They could also snag on clothing when attempting to remove the glasses. They may also be difficult to operate with a single hand when attaching to clothing and when removing from clothing.

It is an object of the invention to address one or more of the above mentioned problems.

The listing or discussion of an apparently prior-published document in this specification should not necessarily be taken as an acknowledgement that the document is part of the state of the art or is common general knowledge.

The present invention provides a spectacle assembly comprising: an eyeglass frame; and a pair of arms connected to the eyeglass frame with respective hinges, each arm comprising an embedded magnetic element, wherein the magnetic elements are arranged to attract one another to effect a closing force on the arms upon hinging the arms towards the eyeglass frame.

There are a number of advantages stemming from embedding a magnetic element in each arm of the spectacle assembly. The magnetic elements have a fixed position and so can be arranged so as to optimally attract the magnetic element in the other arm. For example, the magnetic elements are embedded in the optimal orientation to present the appropriate magnetic pole to the other magnetic element. This is particularly advantageous when each magnetic element comprises a magnet (see below).

The magnetic elements may also be arranged such that they always align appropriately to effect a gripping force when the arms of the spectacle assembly are closed (i.e. spaced at adjacent positions along respective arms). Therefore, the invention can provide a stronger gripping force than US 7,172,283 and thus a much improved solution to the problem of losing or damaging spectacles, when not in use and hooked on clothing.

With the present invention, the user is not required to concern themselves with whether the magnetic elements are aligned, or orientated in the correct polarity to attract, as explained above. Thus, the spectacle assembly of the invention may be operated with a single hand. This is particularly advantageous in typical situations where fast and straight forward attachment of the spectacles to clothing may be required, such as when attaching sunglasses to clothing on holiday when carrying luggage into a building or other instances where only one hand is available to remove the spectacles and attach them to clothing.

Further, the embedded magnetic elements of the invention are less likely to snag clothing, dislodge shirt buttons, etc. than the arrangement in US 7,172,283, because the magnetic elements of the invention are fixed to the spectacle arms and do not present surfaces or configurations that may be prone to catching on clothing. In certain

embodiments of the invention the magnetic elements may protrude from the surface of the spectacle arm. Nevertheless, the magnetic elements are embedded in the arms and do not present hook- or loop- like protrusions. Thus, the invention reduces damage to clothing, which can be expensive to fix.

In an embodiment of the invention, the magnetic element is a magnet. It is envisaged that the magnetic elements may both be permanent magnets. Nevertheless, an alternative arrangement that is also included in the invention is where one spectacle arm comprises an embedded magnet and the other spectacle arm comprises a magnetic element consisting of a ferrous material, which may be attracted by the magnet on the other arm. Alternatively, the spectacle arm comprising the ferrous material may actually be constructed from the ferrous material.

The advantage of both arms comprising mutually attracting magnets may be a stronger gripping force on clothing.

The advantage of one arm comprising a ferrous material rather than a permanent magnet may be reduced cost of manufacture. Also, the spectacles may be manufactured for specific individuals who may prefer only a single magnet, or magnets on only a single spectacle arm. For example, an individual with a ferrous implant (e.g. hearing aid or grommet), or an implant that may be susceptible to malfunction in close proximity with a magnet, or a shrapnel wound, on one side of their skull may require that one arm (corresponding with the side of their skull with the ferrous material or susceptible implant) only comprises ferrous material and not a permanent magnet.

It is envisaged that the magnet used in the invention may be composed of a material comprising neodymium. Thus, the magnet may be a neodymium magnet comprising the $Nd_2Fe_{14}B$ tetragonal crystalline structure. The neodymium comprising magnet may be a sintered or a bonded magnet, for example. Neodymium magnets are particularly suited to use in the invention due to their strong magnetic properties at small dimensions. They provide strong gripping forces in devices of the invention, as described in the examples. The strong magnetic properties of neodymium magnets at small dimensions also benefits the user by reducing the weight of the magnets necessary to achieve the technical effect. Reduced weight benefits the user in terms of comfort but also reduces the potential impact force of the magnets if the arms are allowed to close rapidly and the magnets allowed to clash without intervening trapped clothing. Therefore the potential

for damage to the magnets and to the spectacles, if the spectacles are ill-treated, is reduced.

In a particularly advantageous arrangement, the magnet has a cylindrical form with a diameter between 3 and 5 mm. Such form is suited to the typical shape of the arms of a spectacle assembly and provides a strong gripping force on clothing when the arms of the spectacles are in the closed position. Neodymium magnets of this dimension are particularly suited to the invention.

It is further preferred that the magnet has a length of between 2 and 10 mm. Such length is appropriate to span the thickness of most spectacle arms, thus resulting in an effective gripping force being maintained on clothing. Advantageously, the magnets may protrude from both sides of the spectacle arms (as illustrated in Figures 2A and 2B). Thus, the magnets will always attract whichever way the arms are folded over one another (left over right or right over left) due to the arrangement of the magnetic poles (see Figure 4).

In a particularly preferred embodiment of the spectacle assembly of the invention the magnet has a cylindrical form with a diameter of 3 or 4 mm and a length of 5 mm. Neodymium magnets of these dimensions provide adequate gripping force to hold the spectacles in their closed configuration on clothing and yet allow the user to release the gripping force easily when required.

It is preferred that the attractive magnetic closure force is greater than the weight of the spectacles. The force can be measured as the pull necessary to open the arms with material trapped between attracting magnetic elements. This may be expressed in terms of slipping force, i.e. the force required to slide material pinched by the magnetic elements free. It is preferred that the slipping force is greater than the total weight of the spectacles. Thus, when in use, for example when the spectacles are attached to a shirt on the chest area, when the user stoops or pulls the shirt over their head the glasses should remain in place on the shirt. The assessment of the gripping force in terms of slipping force takes into account not only the strength of the attractive magnetic force and the weight of the spectacles, but also the clothing material thickness and texture (i.e. roughness). It is preferred that the provided force is sufficient to enable the user to be active, for example when playing sports, without loosing the spectacles when they are attached to the user's clothing. Whether or not the force is appropriate may be tested, for example, by shaking clothing with glasses attached. If the spectacles do not fall off then the slipping force may be in an appropriate range.

In an embodiment of the invention, each arm comprises two or more magnetic elements. It is envisaged that each magnetic element would be arranged such that it met an attracting magnetic element on the other arm upon closure of the spectacle arms. Nevertheless, alternative arrangements are envisaged providing the gripping force between the arms is not compromised. An advantage of providing the arms with multiple magnetic elements is a stronger grip on the clothing, as appropriate.

A further advantage of using multiple magnetic elements is that smaller magnetic elements (optionally smaller than those specified above) may be utilised. For example, magnetic elements that are less than 1 mm in diameter or even particulate magnetic material may be used. Such particulate material may be incorporated into the arms of spectacles during manufacture.

Such smaller magnetic elements may not provide sufficient gripping force when used individually, or only in small quantities, but when used collectively will provide sufficient gripping force, as required by the invention. Thus, if smaller magnetic elements are utilised, the overall weight of the glasses may be minimised. Further, smaller magnetic elements may be of particular use in spectacle designs that have very thin arms.

It is envisaged that the magnetic element of the invention may be nickel plated or coated with a polymer. Such coating may be in place on the magnetic element before incorporation into the arm of spectacles of the invention, or may be applied after. Thus, there may be a layer of nickel or polymer, or other suitable material, between the magnetic element and the material of the spectacle arm when the magnetic element is embedded in the arm. Alternatively, only portions of the magnetic element that protrude from, or are visible on, the arm may be coated. Advantages of coating the magnetic elements in this way include a reduced tendency of chipping either during manufacture of the spectacles or during use of the spectacles. Such coatings will also provide the magnetic elements with a smooth finish, thus reducing potential snagging on clothing when in use. Such coatings also prevent corrosion of the magnets.

By "embedded" magnetic element, we include the meaning that the magnetic element is permanently incorporated into the arm of the spectacle assembly. Thus, the magnetic element is fixed in position by any suitable means such that it cannot rotate about the arm, or rotate or otherwise move within its fixture, on or within the arm, during normal use.

The magnetic element may be fixed into a hole, or groove, or divot, or other suitable fixture set into the arm and secured in place as appropriate. The "embedding" of the magnetic element into the arm may be carried out during manufacture of the spectacle assembly, for example, by incorporating the magnetic element into a plastic arm during moulding of the plastic. Alternatively, the magnetic element may be "embedded" into the arm after manufacture of the spectacle assembly, for example, by fixing the magnetic element into a pre-fabricated fixture in the arm. The method of manufacture and of incorporation of the magnetic element into the arm will vary according to the material that the arm is manufactured from. Thus, it is envisaged that the magnetic element may be secured to the arm by interference fit and/or by glue. Such an arrangement may be appropriate when the arm is manufactured from a material that cannot be moulded around the magnetic element. Other appropriate arrangements are envisaged, as indicated above, including inclusion of the magnetic elements in the arm during manufacture in the process of moulding the arm.

The spectacles may be coated in a layer of, for example, a polymer, after the magnetic elements are embedded, such coating thus capable of maintaining the magnetic elements in their desired position. The coating must not be so thick as to compromise the closing force exerted by the magnetic elements.

In a further embodiment of the spectacle assembly of the invention, the magnetic element protrudes from the arm. An advantage of this arrangement may be improved grip on thick clothing, such as a jacket or a thick jumper. Such an arrangement may reduce any potential slippage of the spectacles when gripping clothing. Alternatively, such an arrangement may improve grip of the spectacles on a shirt, for example, where the magnetic elements directly meet between buttons of a shirt and thus the portion between the magnetic element and the uppermost portion of the spectacles forms a cavity whereby the uppermost shirt button acts as an anchor to prevent movement of the glasses out of position. Further, single protruding magnets may help grip the material due to the higher pressure caused by a smaller area of contact compressing the pinched material. This may cause a local flattening and thus embed the magnet and add to the breakout friction force and allow the magnetic faces closer together thus increasing force, especially on thicker materials. Also, as mentioned above, in the arrangement where the magnetic elements protrude, the magnetic elements will always attract whichever way the arms are folded over one another (left over right or right over left) due to the arrangement of the magnetic poles of the magnet or magnets.

In an alternative embodiment of the spectacle assembly of the invention the magnetic element is flush with the surface of the arm. Thus, no protrusion of the magnetic element may be felt by the user. A particular advantage of this arrangement is a reduced possibility of the magnetic element snagging clothing, although, with the arrangement of the invention clothing snagging is unlikely but any further reduction will be welcomed by the user.

The invention further provides a spectacle arm comprising an embedded magnetic element. The spectacle arm is suitable for incorporation into a spectacle assembly as described herein. The spectacle arm and the embedded magnetic element are as described herein. The embedded magnetic elements are arranged in the spectacle arm such that upon connection of a first such spectacle arm, and a second such spectacle arm, to an eyeglass frame via respective hinges (thus forming a spectacle assembly as described herein), they attract one another to effect a closing force on the arms upon hinging the arms towards the eyeglass frame.

The invention also provides a method of manufacturing a spectacle assembly, comprising: embedding a magnetic element into a pair of arms; and attaching the pair of arms to an eyeglass frame with respective hinges, wherein the magnetic elements are arranged to attract one another to effect a closing force on the arms upon hinging the arms towards the eyeglass frame.

The invention further provides for the use of a pair of mutually attracting magnetic elements embedded in respective arms of a spectacle assembly for securing the assembly to articles of clothing when the spectacle assembly is in a closed position, where the magnetic elements effect a gripping force about the clothing.

Embodiments of the invention will now be described, by way of example with reference to the drawings.

Figure 1 illustrates an embodiment of the spectacle assembly 1 of the invention. Figure 2A illustrates the spectacle assembly 1 of Figure 1 in the closed position. Figure 2B illustrates a magnified view of magnetic elements 5,5' clamped on a strip of fabric 7.

Figure 3A illustrates a magnetic element 5 embedded in arm 3. Figure 3B shows a side view of Figure 3A.

Figure 4 illustrates an embodiment of the spectacle assembly 1 of the invention. North (N) and South (S) orientations of the magnetic elements 5,5' are displayed.

Figure 5 illustrates the spectacle assembly 1 of Figure 4 in a closed position.

The invention provides a new and inventive spectacle assembly 1 that enables the spectacles to grip clothing etc. when the arms 3,3' are closed, thus preventing loss and damage of the spectacles by falling when not in use and providing for ease of recovery of spectacles when needed. One embodiment of the spectacle assembly is as illustrated in the figures.

Figure 1 shows a spectacle assembly 1 comprising an eyeglass frame 2 and a pair of arms 3,3' connected to the eyeglass frame 2 with respective hinges 4,4'. Each arm 3,3' of the spectacle assembly 1 comprises an embedded magnetic element 5,5'. The magnetic elements 5,5' are arranged to attract one another to effect a closing force on the arms 3,3' upon hinging the arms towards the nose bridge 6 of the eyeglass frame 2. Thus, the magnetic elements 5,5' are arranged to attract one another when the arms 3,3' are closed. The magnetic elements 5,5' meet at a point in line with the nose bridge 6.

Figure 2A illustrates the spectacle assembly 1 of Figure 1 in the closed position where the arms 3,3' are folded about hinges 4,4' such that the magnetic elements 5,5' are in contact with one another, thus attracting one another and effecting a closing force on the arms 3,3'. The magnetic elements 5,5' are in-line with the nose bridge 6.

Figure 2B illustrates a magnified portion of Figure 2A wherein the interaction of magnetic elements 5,5' is more clearly shown. Figure 2B also shows a strip of fabric 7 that is gripped by the magnetic elements 5,5' when the spectacle assembly is in the closed position. The fabric 7 may be a shirt, pocket or other such material.

The magnetic elements 5,5' may protrude 8 from the arms 3,3' as illustrated in Figures 2A and 2B and in Figure 3A and 3B. Alternatively, the magnetic elements 5,5' may be flush with the arms 3,3' so as to reduce potential snagging on fabric 7. The magnetic elements 5,5' may be held in position with glue and/or interference fit. The magnetic elements 5,5' may be neodymium cylinders of a diameter of 3 or 4 mm and a length of 5 mm.

Figure 3A is a cut away illustration of a cylindrical magnetic element 5 embedded in arm 3 viewed from above such that the magnetic element 5 protrudes from each side of the arm 3. Further, local boss 9 is shown on each side of the arm 3 which increases the thickness of the arm to support the length of the magnet more securely and reduce possibility of snagging.

Figure 3B illustrates the cylindrical magnetic element 5 and arm 3 of Figure 3A viewed from the side, i.e. with the arm 3 rotated 90 degrees. Boss 9 is shown surrounding the end of magnetic element 5 and the shape of the arm 3 is such that it encompasses the magnetic element with a slight bulge.

Figure 4 shows a spectacle assembly 10 comprising an eyeglass frame 12 and a pair of arms 13,13' connected to the eyeglass frame 12 with respective hinges 14,14'. Each arm 13,13' of the spectacle assembly 10 comprises an embedded magnetic element 15,15'. The magnetic elements 15,15' are arranged to attract one another to effect a closing force on the arms 13,13' upon hinging the arms towards the nose bridge 16 of the eyeglass frame 12. Thus, the magnetic elements 15,15' are arranged to attract one another when the arms 13,13' are closed. The magnetic elements 15,15' meet at a point in line with the nose bridge 16. North (N)/South (S) orientation of magnetic elements 15,15' is such that closure of the arms 13,13' effects attraction between the magnetic elements 15,15' no matter which way the arms are folded (left over right or right over left).

Figure 5A illustrates the spectacle assembly 10 of Figure 4 in the closed position where the arms 13,13' are folded about hinges 14,14' such that the magnetic elements 15,15' are in contact with one another, thus attracting one another and effecting a closing force on the arms 13,13'. The magnetic elements 15,15' are in-line with the nose bridge 16.

Figure 5B illustrates a magnified portion of Figure 5A wherein the interaction of magnetic elements 15,15' is more clearly shown. Figure 5B also shows a strip of fabric 17 that is gripped by the magnetic elements 15,15' when the spectacle assembly 10 is in the closed position. The fabric 17 may be a shirt, pocket or other such material.

CLAIMS

1. A spectacle assembly comprising:

an eyeglass frame; and

a pair of arms connected to the eyeglass frame with respective hinges, each arm comprising an embedded magnetic element,

wherein the magnetic elements are arranged to attract one another to effect a closing force on the arms upon hinging the arms towards the eyeglass frame.

2. The spectacle assembly of Claim 1, wherein the magnetic element is a magnet.

3. The spectacle assembly of Claim 2, wherein the magnet is composed of a material comprising neodymium.

4. The spectacle assembly of Claim 3, wherein the magnet is a neodymium magnet comprising the $Nd_2Fe_{14}B$ tetragonal crystalline structure.

5. The spectacle assembly of Claim 3 or 4, wherein the neodymium comprising magnet is a sintered or a bonded magnet.

6. The spectacle assembly of any of Claims 2 to 5, wherein the magnet has a cylindrical form with a diameter between 3 and 5 mm.

7. The spectacle assembly of any of Claims 2 to 6, wherein the magnet has a length of between 2 and 10 mm.

8. The spectacle assembly of Claim 6 or 7, wherein the magnet has a cylindrical form with a diameter of 3 or 4 mm and a length of 5 mm.

9. The spectacle assembly of any preceding claim, wherein each arm comprises two or more magnetic elements.

10. The spectacle assembly of any preceding claim, wherein the magnetic element is nickel plated or coated with a polymer.

11. The spectacle assembly of any preceding claim, wherein the magnetic element is secured to the arm by interference fit and/or glue.

12. The spectacle assembly of any preceding claim, wherein the magnetic element protrudes from the arm.

13. The spectacle assembly of any of Claims 1 to 11, wherein the magnetic element is flush with the surface of the arm.

14. A spectacle arm comprising an embedded magnetic element.

15. The spectacle arm of Claim 14, wherein the embedded magnetic element is as specified in any one of Claims 2 to 13.

16. A method of manufacturing a spectacle assembly, comprising:

embedding a magnetic element into a pair of arms; and

attaching the pair of arms to an eyeglass frame with respective hinges,

wherein the magnetic elements are arranged to attract one another to effect a closing force on the arms upon hinging the arms towards the eyeglass frame.

17. Use of a pair of mutually attracting magnetic elements embedded in respective arms of a spectacle assembly for securing the assembly to articles of clothing when the spectacle assembly is in a closed position, where the magnetic elements effect a gripping force about the clothing.

18. A spectacle assembly substantially as described herein, with reference to the accompanying drawings.

Application No:	GB1102467.6	**Examiner:**	Donal Grace
Claims searched:	1 to 18	**Date of search:**	2 June 2011

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1 to 18	WO 2004/049040 A1 (DIETZ) see especially page 9 line 29 to page 10 line 13
X	1 to 18	WO 2005/050288 A1 (MACDONALD et al) see figures 22 to 24 and page 10 lines 15 to 19
X	1 to 18	WO 2005/001550 A2 (DIETZ) see whole disclosure
X	1 to 18	WO 2004/083938 A2 (DIETZ) see whole disclosure
X	1, 2 and 13 to 17	US 6425664 B1 (LIU et al) see figures and column 2 lines 16 to 38
X	1, 2, 14, 15, 16 and 17 at least	JP 2009294627 A (NAKANISHI) see figures, especially 1 and 3, EPODOC abstract and WPI abstract acc no 2009-S38685 [01]
X	1, 14, 16 and 17 at least	CN 101581831 A (YAN) see figures, EPODOC abstract and WPI abstract acc no 2009-R78087 [81]
X	1, 14, 16 and 17 at least	JP 2004279675 A (KOBAYASHI) see figures, EPODOC abstract and WPI abstract acc no 2004-685681 [67]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

G02C

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI, TXTE

International Classification:

Subclass	Subgroup	Valid From
G02C	0005/14	01/01/2006
G02C	0003/04	01/01/2006
G02C	0011/00	01/01/2006
G02C	0013/00	01/01/2006