Aug. 27, 1968 G. CROXSON ETAL 3,398,425

HINGES

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Fig. 1.

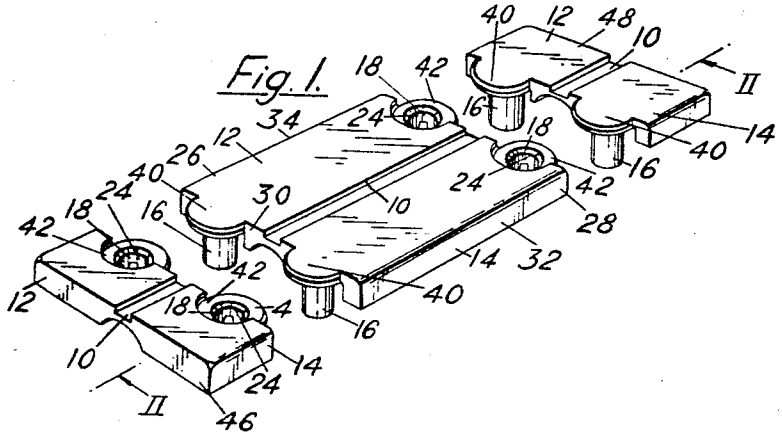


Fig. 2.

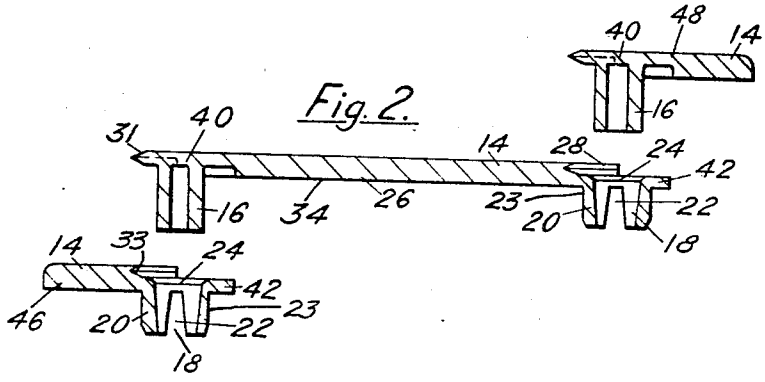
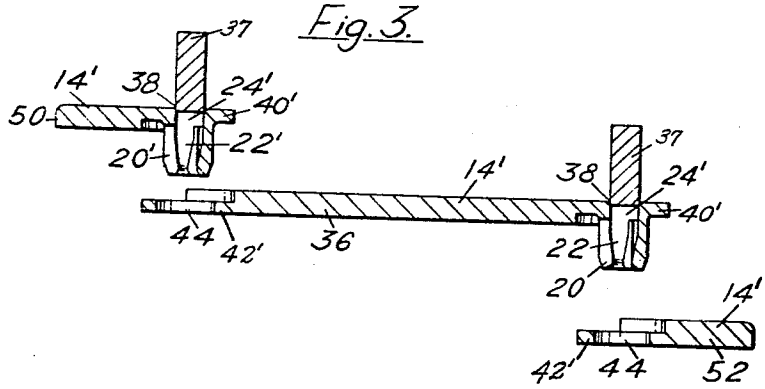


Fig. 3.



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HINGES

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ABSTRACT OF THE DISCLOSURE

Plastic hinge capable of taking up variations in total length caused by thermal expansion of the plastic hinge material comprises a plurality of individual hinge units having aligned hinging portions and cooperating fastening means.

According to this invention an integrally formed hinge unit of plastic has a first body portion which connects to a hinging portion, which hinging portion connects on its opposite side to a second body portion, each body portion including at least one fastener part which fastener part has co-operating means for association with a complementary co-operating means on an adjacent hinge unit, said fastener parts interconnecting two members to which they are applied, and simultaneously interconnecting the two hinge units.

Examples of hinges embodying the invention are described below with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of three hinge units, in combination with a first fastening means;

FIGURE 2 is a sectional side elevation taken as indicated by the lines II—II in FIGURE 1;

FIGURE 3 is a view similar to that of FIGURE 2 but of three hinge units using a second fastening means.

Each hinge unit is substantially rectangular when viewed in plan, and has a portion **10** extending transversely across it which is thinner than the rest of the unit. This thinner portion constitutes the hinging portion; the two rectangular parts **12** and **14** on either side of it constitute the body portions. Each body portion has projecting from it a male fastener part or member **16** and a female fastener part or member **18**, which constitutes in conjunction the fastening means.

The female member consists of a plurality of resilient legs **20** defining between them a socket **22** which is coaxial with a hole **24** passing through the body portion. In the arrangement seen the socket is narrower measured at the free ends of the legs than at the body portion, and the outer faces **23** of the legs are substantially parallel.

Alternatively the socket could be of uniform width and the outwardly facing surfaces of the legs made divergent from the body portion. The male member **16** in its simplest form is a cylindrical pin, which in the first embodiment is hollow.

Referring to the centrally lying unit **26** of FIGURES 1 and 2, and defining those edges **28, 30** of the hinge unit which are perpendicular to the hinge **10** as the "ends," and the two edges **32, 34** lying parallel to the hinge as the "sides," the two male members **16** lie near one end, and the two female members **18** lie near the other end, all four projecting in the same direction.

In the hinge units seen in FIGURE 3, the intermediate unit **36** has a male fastener member which comprises legs **20'** having between them a socket **22'** which is coaxial with a hole **24'** passing through the body portion. The socket **22'** converges away from the body portion. The fastener member further comprises a pin **37** which is attached to the body portion by small webs **38**. The female

part is merely a hole **44** which is of a size to just receive the legs **20'**.

Adjacent to the ends of the unit **34** or **36** are units **46, 48**, or **50, 52** respectively. These are merely the two halves of the associated central unit **34** or **36** and serve to make neat ends to an assembly of hinge units, as is described below. The unit **46** has two female members, the unit **48** two male members. The unit **50** has two male and two female members, so that the unit **52** merely requires to have the holes **44**.

In the arrangement seen the male and female members are formed on semi-circular portions **40** and **42** or **40'** and **42'** respectively, extending from an end of the unit; these portions have half the thickness of the rest of the body of the unit. They are arranged so that one of the faces of the portion is coplanar with a face of the body portion. The tapered lips **31** of the semi-circular portions **40** interengage with the complementary recesses **33** in the adjacent member so that the hinge members are more effectively locked together to prevent removal of the pin **16** from the mating female portion **20**.

In use each hinge unit is used to fasten together two members, the members lying on opposite sides of the hinging part **10**. Each member has holes along the edge at which it is joined, the size of the holes is that of the holes **44**, and their spacing is equal to the distance between the axes of the male and female members on the unit **34**.

Considering firstly the assembling of the units seen in FIGURES 1 and 2, an end unit **46** is laid across the abutting faces of the members to be joined, the hinge **10** lying in line with the said faces, and each of the female members **18** lying in or through a hole in the respective member. A unit **34** is then applied to the unit **46** in the manner seen in FIGURE 2. The male member is inserted into the hole **24** and further pressed along the tapered cavity **22** so that the legs **20** are urged and held outwards to be securely mounted in the holes in the members.

Because of the spacing of the holes along the edges of the members, the female members **18** of the unit **34** then lie immediately above, and can be pressed into or through, another hole in each of the members.

A further unit **34** can be applied to these female members as described, and the operation can be repeated along the entire length of the abutting, or nearly abutting, edges of the members to be joined.

For neatness the last unit applied is a unit **48**. This only presents male members to cooperate with the female members of penultimate unit.

In assembling the arrangement of FIGURE 3, an end member **52** is laid across the abutting or nearly abutting edges of the two members, each of the two holes **44** lying coterminous with a hole in one of the members. The female members of a unit **36** are then pressed through the holes **44** and so into or through the holes in the members. The pins **37** are then struck inwards so that the webs **38** are fractured in shear and the male pins are driven along the tapered cavities **22'** to urge and hold the legs to be divergent.

As described above, the holes **44** of the connected unit **36** will coincide with further holes in the members so that a further unit **36** can be applied. The operation is continued along the length of the abutting edges, the last unit being a unit **50**.

As is clear from FIGURES 2 and 3 the circular portions are of half the thickness of the body generally and being coterminous on their one side with the semicircular portions **40** and **42**, interengage to give a joint which is of the same thickness as the body generally.

A major advantage provided by a long hinge made up of a number of units according to this invention is that

any incompatibility of thermal expansion of the material of the hinge and that or those of the independent members, is tolerated by movement between individual units, so the buckling encountered in the known constructions of long hinges is overcome.

The holes **44** may be elongated to make provision for thermal expansion.

We claim:

1. An integrally formed hinge unit of plastic comprising first and second body portions connected to each other by a longitudinally extending hinging portion having a thickness less than that of the body portions, at least one fastener member on each of said body portions and located at the same end of said hinge unit, said at least one fastener member having cooperating means adapted to be associated with a complementary fastener member on an adjaceint hinge unit for locking said hinge unit to said adjacent hinge unit so that the hinging portions of adjacent hinge units will be aligned, whereby, when a plurality of said hinge units are arranged in aligned cooperating relation with each other the cooperating means will take up variations in total hinge length caused by thermal expansion of the material of the hinge units.

2. A hinge unit according to claim **1** in which a fastenera part is a female member which comprises a plurality of legs extending outwards from the body portion and defining between them a cavity which is in line with a hole through the body portion, the form of the legs and the cavity being such that when a pin lies in the cavity the outer surfaces of the legs diverge from the body portion.

3. A hinge according to claim **1** in which a fastener part is a male member which comprises a pin extending from the body portion.

4. A hinge according to claim **3** in which the pin is weakly attached to a body portion by an integral web, and lies in line with a hole through the body portion.

5. A hinge according to claim **1** in which a fastener part comprises a hole passing through a body portion, at least two legs extending from one side of the body portion and defining between them a cavity, and a pin extending from the other side of the body portion and being weakly attached to thereto by a web, the cavity, the hole and the pin being coaxial.

6. A hinge according to claim **5** in which the complementary fastener part is a loop through which the legs may be passed.

7. A hinge according to claim **3** in which one fastener part is a pin rigidly formed on the body portion and the complementary part is the legs, the cavity and the hole of another body portion.

8. A hinge according to claim **1** which has a pair of identical fasteners parts at one end, and has a pair of identical complementary parts at its other end, one of each of the pairs lying on each side of the hinging portion.

9. A hinge according to claim **1** in which the annular part of the body portion immediately surrounding a fastener part is of half the thickness of the body portions generally.

10. A hinge according to claim **1** in which each fastener parts has its axis lying at the centre of curvature of a semicircular portion projecting from the end of the body portion.

11. A hinge according to claim **10** in which the semicircular portion has tapered lips which interengage with complementary shaped recesses in the adjacent member.

References Cited

UNITED STATES PATENTS

2,775,093	12/1956	Kundert.	
2,791,868	5/1957	Viken	59—80
2,943,415	7/1960	Viken	46—28
3,144,695	8/1964	Budwig	24—16
3,279,014	10/1966	Fischer	24—115

FOREIGN PATENTS

883,895	12/1961	Great Britain.
981,805	1/1965	Great Britain.
1,007,683	10/1965	Great Britain.

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