

"APPARATUS COMPRISING THREE SEPARABLE
PARTS; FISH FEEDER"

This invention concerns apparatus comprising separable parts and, although it is not so restricted, it is more particularly concerned with apparatus for feeding a quantity of a foodstuff to fish (e.g. goldfish and tropical fish) and other creatures at predetermined times.

According to the present invention, there is provided apparatus comprising first, second and third parts, the first part having first connector means resiliently engageable with a first engagement portion of the third part so as to interconnect the first and third parts, the first and third parts being disconnectable on a predetermined degree of movement of the first connector means away from the first engagement portion; the second part having second connector means resiliently engageable with a second engagement portion of the third part so as to interconnect the second and third parts, the second and third parts being disconnectable on a predetermined degree of movement of the second connector means away from the second engagement portion; the arrangement being such that, when the first, second and third parts are all connected together, the second connector means is prevented by the first connector means from undergoing the said predetermined degree of movement until the first connector means has been withdrawn from the first engagement portion so that relative separation of the first and third parts must occur before relative separation of the second and third parts can be effected.

Preferably, each of the connector means comprises

a pair of resilient engagement arms which are a snap fitting with the respective engagement portion.

Each of the engagement portions may be constituted by a surface of a hole within the third part.

At least a portion of the hole may be rectangular in cross-section, each of the engagement portions being constituted by a respective pair of oppositely disposed surfaces of the said portion of the hole.

Preferably, the second and third parts collectively form a box.

The first part may comprise drive means for rotating the box. Moreover, the first part may be provided with timer means such that the box is rotated through one complete revolution at predetermined intervals.

The apparatus is preferably a feed apparatus for feeding fish or other creatures.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:-

Figure 1 is a partially cut-away exploded view of one embodiment of an apparatus according to the present invention,

Figure 2 is an exploded sectional view of a part of the apparatus shown in Figure 1;

Figure 3 is a sectional view of the assembled apparatus shown in Figure 1; and

Figure 4 is a sectional view taken on the line a-a in Figure 3.

In our Utility Model Application No. 77021/1988, which was not published at the priority date hereof, there is disclosed an apparatus for periodically supplying feed to goldfish and tropical fish kept in a water tank. This apparatus, or automatic feeder, is so designed as to supply a given amount of granular feed in

one rotation of a feed box which is periodically rotated by means of a drive apparatus which contains timer means. The feed box is detachably connected to a drive shaft of a drive apparatus by snap fitting means.

50 The feed box may comprise a container and a cover which is detachable from the container by snap fitting means for the purpose of facilitating a supply of feed to the feed box. The use of a feed box having such snap fitting means, however, involves the following problem.

10 As the feed box must be separated from the drive apparatus in order to supply feed to the feed box, if the feed box is separated from the drive apparatus by holding the container, the cover of the feed box can be separated from the container so that any feed in the
15 latter is scattered.

Accordingly, in the embodiment described below, the feed box as a whole can be separated from the drive apparatus without difficulty even though snap fitting means are used to interconnect the parts of the feed box
20 itself.

Thus in the embodiment described below, when the feed box is separated from the drive apparatus, since the resilient engagement arms of the drive shaft are placed in the gap between the resilient engagement arms of the cover, the resilient engagement arms of the cover
25 are prevented from being inwardly deformed. The container of the feed box cannot therefore be separated from the cover unless the resilient engagement arms of the drive apparatus have been separated from the
30 respective engagement portions.

In the embodiment of the invention shown in the drawings, the apparatus comprises a first part or rotational drive means 1; a second part or cover 4; and a third part or container 3, the parts 3, 4 collectively

constituting a feed box 2.

As shown in Figure 1, the feed box 2 is detachably connected to the rear side of the rotational drive means 1 which contains a timer set mechanism (not shown) operated at predetermined times. The feed box 2 is designed so as to be periodically rotated by the drive means 1.

The cover 4 of the feed box 2 is detachably coupled to the container 3 by snap fitting means. As shown in Figure 2, the snap fitting coupling between the container 3 of the feed box 2 and the cover 4 thereof comprises engagement portions 31a in the form of a pair of oppositely disposed surfaces or steps of a rectangular cross-section portion of a hole 31 formed at the centre of the container 3. The said coupling also comprises engagement claws 41a, 41a formed at the ends of two resilient engagement arms 41, 41 integrally formed on the cover 4. Thus the arms 41, 41 and claws 41a, 41a are resiliently engageable with the engagement portions 31a of the container 3 so as to interconnect the cover 4 and container 3, the parts 3, 4 being disconnectible from each other by manually effecting a predetermined degree of movement of the arms 41 away from the engagement portions 31a, i.e., by pressing the arms 41 inwardly towards each other.

A description will now be provided, with reference to Figure 1 or Figure 3, of the coupling structure between the rotational drive means 1 and the feed box 2.

A drive shaft 5 extends rearwardly from the frame of the rotational drive means 1 and is rotated by a drive from a rotational drive wheel (not shown) which is provided in the rotational drive means 1. Two resilient engagement arms 51, 51 are formed at the end of the drive shaft 5. Engagement claws 51a, 51a respectively

5. extend outwardly from the ends of the engagement arms 51, 51 so as to be able to engage in a snap fitting manner with engagement portions 31b. The latter are constituted by a pair of oppositely disposed surfaces or steps 31b of the said rectangular cross-section portion of the hole 31, the surfaces 31b being arranged alternately with the surfaces 31a. Thus each of the surfaces 31b is at an angle of 90 degrees to the adjacent surfaces 31a in the inner wall of the hole 31 of the feed box 2.

10 The arms 51 and claws 51a are resiliently engageable with the surfaces 31b so as to interconnect the rotational drive means 1 and the container 3, the parts 1, 3 being disconnectable from each other by manually effecting a predetermined degree of movement of the arms 51 away from the surfaces 31b, i.e. by pressing the arms 51 inwardly towards each other.

15 The positional relationship between the resilient engagement arms 51, 51 of the rotational drive means 1 and the resilient engagement arms 41, 41 of the feed box 2 in the engagement hole 31 is shown in Figure 4. The resilient engagement arms 51, 51 are inserted into the gaps between the resilient engagement arms 41, 41 which are thus prevented by the engagement arms 51, 51 from being capable of being pressed towards each other when the parts are disposed as shown in Figure 4.

20 When the feed box 2 is being separated from the rotational drive means 1, therefore, the engagement arms 41, 41 are prevented from being inwardly deformed because the resilient engagement arms 51, 51 of the driving shaft 5 are inserted into the gaps between the resilient engagement arms 41, 41 even if the feed box 2 is separated by holding the container 3. Thus, the resilient engagement arms 51, 51 of the drive shaft 5 of

the rotational drive means 1 are first separated from the engagement portions 31b in the engagement hole 31. After the feed box 2 has been separated from the rotational drive means 1, the resilient engagement arms 41, 41 of the cover 4 are easily deformed inwardly and the container 3 can be separated from the cover 4 when the container 3 of the feed box 2 and the cover 4 thereof are held by the hands and then pulled in opposite directions to each other.

The embodiment shown in the drawings enables the whole of the feed box 2 to be separated from the rotational drive means 1 without any difficulty and then the container 3 of the feed box 2 can be separated from the cover 4 thereof after the feed box 2 has been separated from the rotational drive means 1 for the purpose of supplying feed.

CLAIMS

1. Apparatus comprising first, second and third parts, the first part having first connector means resiliently engageable with a first engagement portion of the third part so as to interconnect the first and third parts, the first and third parts being disconnectable on a predetermined degree of movement of the first connector means away from the first engagement portion; the second part having second connector means resiliently engageable with a second engagement portion of the third part so as to interconnect the second and third parts, the second and third parts being disconnectable on a predetermined degree of movement of the second connector means away from the second engagement portion; the arrangement being such that, when the first, second and third parts are all connected together, the second connector means is prevented by the first connector means from undergoing the said predetermined degree of movement until the first connector means has been withdrawn from the first engagement portion so that relative separation of the first and third parts must occur before relative separation of the second and third parts can be effected.
2. Apparatus as claimed in claim 1 in which each of the connector means comprises a pair of resilient engagement arms which are a snap fitting with the respective engagement portion.
3. Apparatus as claimed in claim 2 in which each of the engagement portions is constituted by a surface of a hole within the third part.
4. Apparatus as claimed in claim 3 in which at



least a portion of the hole is rectangular in cross-section, each of the engagement portions being constituted by a respective pair of oppositely disposed surfaces of the said portion of the hole.

5 5. Apparatus as claimed in any preceding claim in which the second and third parts collectively form a box.

6. Apparatus as claimed in claim 5 in which the first part comprises drive means for rotating the box.

10 7. Apparatus as claimed in claim 6 in which the first part is provided with timer means such that the box is rotated through one complete revolution at predetermined intervals.

15 8. Apparatus as claimed in any preceding claim in which the apparatus is a feed apparatus for feeding fish or other creatures.

9. Apparatus comprising separable parts substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

20 10. A feeder comprising a rotational driving apparatus and a feed box which is detachably connected to said rotational driving apparatus and caused to rotate by said driving apparatus, in which

25 said feed box comprises a container and a cover detachably coupled with said container by a snap fitting method;

30 the coupling structure between said container and said cover comprises engagement in a snap fitting manner between engagement portions formed on the inner walls of an engagement hole of said container and two elastic engagement arms integrally formed on said cover;

two elastic engagement arms are formed at the end of the driving shaft projecting from said rotational driving apparatus; and



5 said elastic engagement arms of said driving
apparatus are inserted into said elastic engagement arms
of said cover and engage in a snap fitting manner with
said engagement portions formed on the inner walls of
said engagement hole of said feed box in such a manner
that any inward deformation of said elastic engagement
arms of said cover is inhibited.

10 11. Any novel integer or step, or combination of
integers or steps, hereinbefore described and/or shown
in the accompanying drawings, irrespective of whether
the present claim is within the scope of, or relates to
the same or a different invention from that of the
preceding claims.

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