

ON ABOUT DESIGN AND IMPLEMENTATION OF A HARVESTER FOR FRENCH AND ENGLISH MARIGOLD

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The construction of a harvester-device for *Calendula officinalis* and *Tagetes patula* was proposed and is presented. The prototype development took into consideration the following aspects of medicinal plants of interest: length of plant, flower width, average distance between plants (0.20-0.30 m *Calendula officinalis* and 0.25-0.30 m *Tagetes patula*). A constructive testing was performed in order to choose the best constructive solution taking into account the following aspects: efficacy of flowers harvester, quality of flowers (number of integral flowers recuperated from a stem), device mass, energetic input per recuperated flowers, facile manipulation. According to the result of constructive testing, the harvester device was developed and tested in field. Good performances were obtained for *Calendula officinalis* (a ratio of flowers recuperation of 70-80%) and satisfactory for *Tagetes patula* (a ratio of flowers recuperation of 60-70%).

The principle of development and the implementation of a device able to harvest the *Calendula officinalis* and *Tagetes patula* flowers was the aim of the research.

The harvester must be done in correlation with the desired product (e.g. at three weeks after the flowering for preparation of essential oils). An alternative solution for flowers harvester (a mechanic device for hand harvester) able to harvest exactly the complete flowered plants was proposed but never constructed. A series of patents were elaborated for *Calendula officinalis* and *Tagetes patula*, but any reference of harvester-device cannot be found. Two patents are presented in the Table.

United States Patents for harvester: <i>Calendula officinalis</i> and <i>Tagetes patula</i>		
No.	1	2
Name	Flower harvesters	Selective harvesting machine
ID	4761942	5501067
Registration data	December 9, 1986	July 29, 1994
Patent data	August 9, 1988	March 26, 1996
Author	Geoffrey A. Williams	Claude E. Brown
Society	Williams Hi-Tech Int. Pty. Ltd.	Claude E. Brown
County, Country	Warragul, Australia	Lodi, California, USA
USPTO classification	56/121.4 ; 56/13.1 ; 56/364	56/121.4 ; 56/13.1 ; 56/364
ISO classification	A01D 45/00 (20060101)	A01D 45/00 (20060101)

RESULTS AND DISCUSSIONS

The flowers harvester is a mobile device that contains a vat with a harvester-rotor installed at its end; the rotor employs the stem of the plant to underlay the flowers into the vat as the answer of moving the device into the field. The projection of the harvester-device took into consideration the specification of *Calendula officinalis* and *Tagetes patula* flowers as length of plant, flower width, average distance between plants (0.20-0.30 m *Calendula officinalis* and 0.25-0.30 m *Tagetes patula*). The slicing system constitute also the subject in projection of the harvester-device. A series of devices constitute the subject of execution technical draw. The realization of harvester-device prototype for *Calendula officinalis* and *Tagetes patula* was done in more phases. Thus, the subassembly devices were projected, their functionality were tested in different filed conditions and ability in harvest of flowers taking into account that the separation between flowers and stem has a mechanical efficiency which rarely exceed 80%. The aim of constructive testing was to choose the best constructive solution taking into account the following aspects: efficacy of harvester, quality of flowers (no. of integral flowers recovered from a stem), device mass, energetic input per recovered flowers, facile manipulation. The ended of the tests of subassembly devices leads to finalization of the prototype, which become the harvester-device.



Fig 1. The ensemble of the harvester-device



Fig 2. The ensemble of the slicing-device

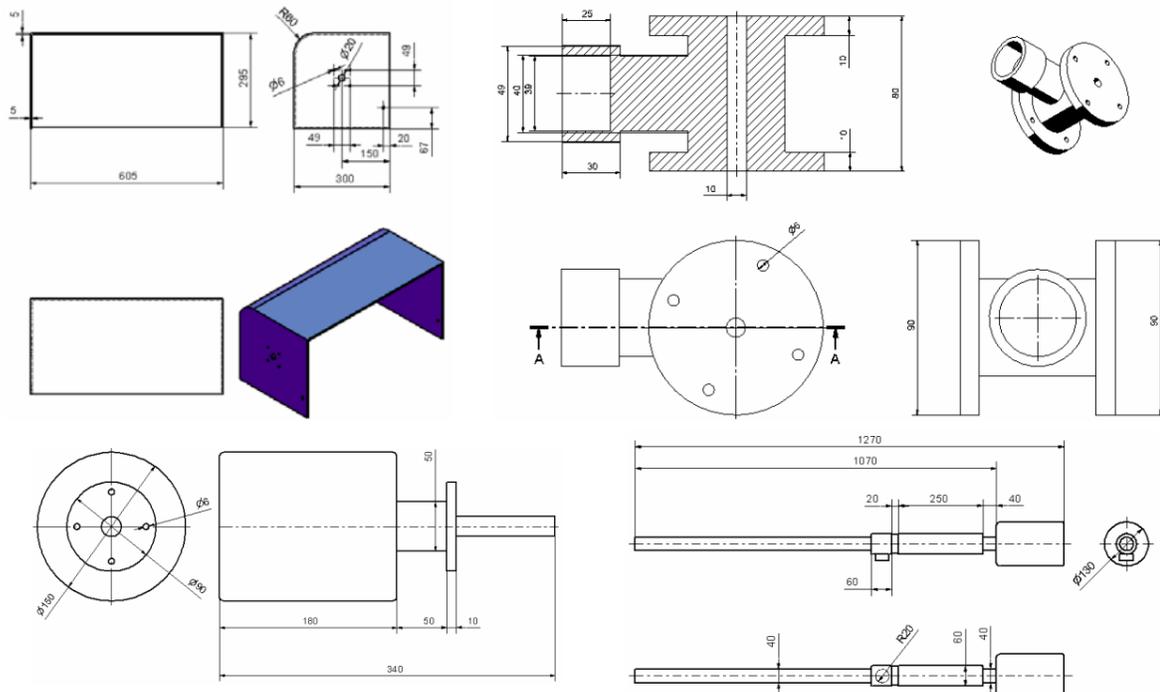


Fig 3. Draw for vat, the plate for fixation of vat on the maintenance stem, engine box and maintenance stem

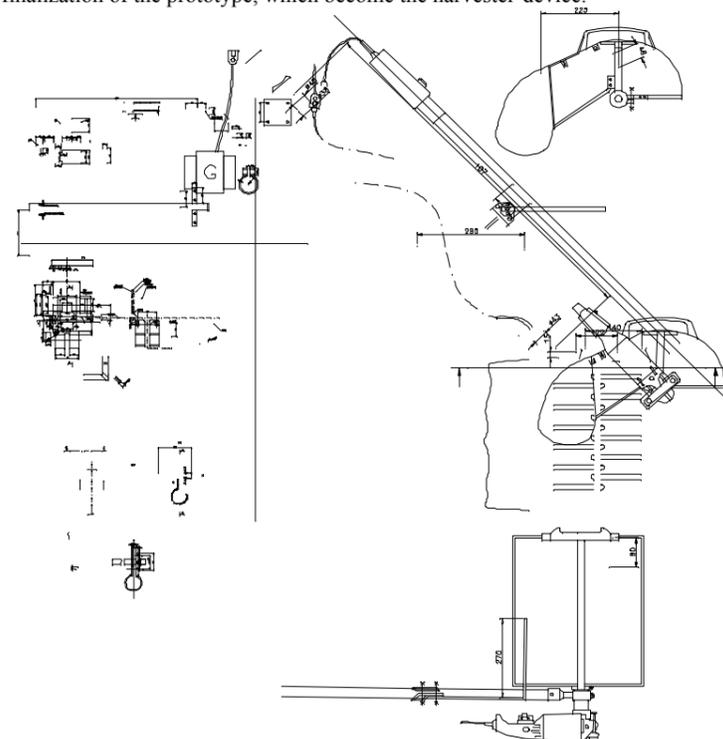


Fig 4. Diagram & constructive details of proposed harvester-device



Figure 5. Prototype: developed harvester-device

The optimum speed of slicing system proved to be at 150 rot/min for *Calendula officinalis* and 210 rot/min for *Tagetes patula*. The mechanic system contains the power source (a gasoline engine coupled to an electromotor that represents the power source for the harvester-device). A cable is used for making the link between the components of the harvester-device and has the role of assuring the power-source for the engine put on the end of the harvester-device. This constructive solution allows that autonomy of the power-source of 4-5 hours and the possibility to be locating at the border of field for harvest. The constructive solution that gave the best results regarding the harvester of the maximum number of flowers from a stem without deterioration was of using the knife of spiral slicing. The sack for depositing the harvested flowers that has a capacity of 1-2 kg (the capacity varies to the type of flowers and their dimensions). The harvester device was tested in the field. The results obtained in harvester of *Calendula officinalis* were good (a ratio of flowers recuperation of 70-80%) while of *Tagetes patula* was satisfactory (a ratio of flowers recuperation of 60-70%).

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